



**US Army Corps  
of Engineers**  
Construction Engineering  
Research Laboratories



# **The Environmental Compliance Assessment Management Program (ECAMP) Air National Guard Supplement for The Environmental Assessment and Management (TEAM) Guide**

*Revised September 1997*

Beginning in 1992, the U.S. Army Construction Engineering Research Laboratories (USACERL), in cooperation with the U.S. Air National Guard (ANG), began the research that led to the publication of the Environmental Compliance Assessment and Management Program (ECAMP) ANG. After the development of the single compliance assessment manual for use by all members of the Department of Defense (The Environmental Assessment and Management (TEAM) Guide), the ECAMP-ANG supplement was developed to examine Air Force Instructions, Air Force Manuals, and Air Force Policies in conjunction with the TEAM Guide. In 1994 USACERL was tasked with research and development leading to the inclusion of a chapter for use in assessing compliance with Occupational Safety and Health Administration (OSHA) regulations targeting environmental/occupational health. That work appeared as Section 14 of ECAMP-ANG. Since 1994, ANG has broadened the scope of work to include safety issues as well.

The material formerly covered in Section 14 of ECAMP-ANG is now covered in ECAMP-ANG, Volume 2. Part I of Volume 2 is devoted to a number of environmental/occupational health issues raised by Title 29 of the Code of Federal Regulations (CFR), Part 1910, and/or Air Force Occupational Safety and Health (AFOSH) Standards; Part II of Volume 2 addresses safety issues covered by 29 CFR 1910 and/or AFOSH Standards.

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**ECAMP-ANG Supplement, Vol. 2**

**Part I:**

**Environmental/Occupational Health**

## FOREWORD

This is USACERL Special Report 95/36, Vol. 2, revised September 1997. The report is up-to-date through 62 *Federal Register*, No. 125, dated 30 June 1997.

The research was performed for the Air National Guard Readiness Center (ANGRC), under Military Interdepartmental Purchase Request (MIPR) number 97-30-20, dated 26 November 1996. The ANGRG technical monitor was Mr. Chuck Smith, ANGRG/CEVC.

The research was performed by the Planning and Management Laboratory, Environmental Processes Division (PL-N), of the U.S. Army Construction Engineering Research Laboratories (USACERL). The Principal Investigator was Dr. David A. Krooks, PL-N. L. Jerome Benson is Acting Division Chief, PL-N. L. Michael Golish is Operations Chief, PL.

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## PART I: ENVIRONMENTAL/OCCUPATIONAL HEALTH

### ECAMP-ANG

September 1997

#### A. Applicability of this Protocol

This section includes Federal regulations and the responsibilities and requirements derived from them that have to do with personal protective equipment, various air contaminants, and bloodborne pathogens at Air National Guard (ANG) installations. Requirements for ventilation, hazardous noise, ionizing and nonionizing radiation, permit-required confined spaces, and hazard communication are also covered here. This section also takes into account requirements imposed by a narrow range of Air Force Occupational Safety and Health Standards (AFOSH STD), but neither ANG Regulations (ANGRs) nor Air Force Instructions (AFIs) are systematically included.

The wide range of Federally regulated topics covered here may raise issues with regard to training, workplace air quality, medical surveillance, engineering and work practice controls, and/or recordkeeping. As a result, it can be expected that some portions of this section will apply to every ANG installation.

None of the requirements in this section apply to state employees working on an ANG facility. It is the sole responsibility of the individual state to provide occupational health support for its workers. No ANG funds shall be expended to provide medical monitoring, industrial hygiene, or personal protective equipment (PPE) for state employees.

#### B. Federal Legislation

- 10 Code of Federal Regulations (CFR) 20, *Standards for Protection Against Radiation*, establishes standards for protection against ionizing radiation.
- 29 CFR 1904, *Recording and Reporting Occupational Injuries and Illnesses*, establishes requirements related to recording and reporting occupational injuries and illnesses.
- 29 CFR 1910, *Occupational Safety and Health Standards*. The *Occupational Safety and Health Act* of 1970, requires employers to provide workers with a safe workplace. Regulations promulgated pursuant to this Act are compiled at 29 CFR 1910 and contain specific requirements for particular types of workplace hazards. This part of Volume 2 of the ECAMP supplement addresses 29 CFR requirements that apply in the following topic areas:
  1. Ventilation (1910.94)
  2. Occupational Noise Exposure (1910.95)
  3. Nonionizing Radiation (1910.97)
  4. Spray Finishing Using Flammable and Combustible Materials (1910.107)
  5. Dip Tanks containing Flammable or Combustible Liquids (1910.108)
  6. Emergency Response to Hazardous Substance Releases (1910.120(q))
  7. Personal Protective Equipment (1910.132 through 1910.134 and 1910.138)
  8. Sanitation (1910.141)
  9. Permit-Required Confined-Space Entry (1910.146)
  10. Medical Services and First Aid (1910.151)
  11. Air contaminants that are not regulated by their own Occupational Safety and Health Administration (OSHA) Standard (1910.1000)

12. Certain air contaminants that are regulated by their own OSHA Standard:
    - a. Asbestos (1910.1001)
    - b. Lead (1910.1025)
    - c. Cadmium (1910.1027)
    - d. Benzene (1910.1028)
    - e. Methylene Chloride (1910.1052)
  13. Bloodborne Pathogens (1910.1030)
  14. Hazard Communication (1910.1200).
- 29 CFR 1926, *Safety and Health Regulations for Construction*. Section 107 of the *Contract Work Hours and Safety Act*, requires employers to provide workers with a safe construction workplace. Regulations promulgated pursuant to this Act are compiled at 29 CFR 1926 and contain specific requirements for particular types of construction site hazards. This part of Volume 2 of the ECAMP supplement addresses 29 CFR requirements that apply in the following topic areas:
    1. General Construction Concerns (1926.21 through 1926.56)
    2. Lead (1926.62)
    3. Asbestos (1926.1101).
  - 29 CFR 1960, *Basic Program Elements for Federal Employee OSH Programs and Related Matters*, establishes the basic program elements for all agencies of the Executive Branch. They apply to all working conditions of Federal employees except those that involve uniquely military equipment, operations, and systems. These elements include:
    1. Qualifications of Safety and Health Inspectors
    2. Conduct of Inspections
    3. Notices of Unsafe and Unhealthful Working Conditions
    4. Abatement of Unsafe and Unhealthful Working Conditions.

### **C. State/Local Requirements**

- Neither state nor local requirements are included in this part of the ECAMP supplement.

### **D. Department of Defense (DOD) Regulations**

- DOD Instruction (DODI) 6055.1, *DOD Occupational Safety and Occupational Health Program*, 26 October 1984, through Change 1, 11 April 1989.
- DODI 6055.5, *Industrial Hygiene and Occupational Health*, 6 May 1996.
- DODI 6055.12, *DOD Hearing Conservation Program*, 22 April 1996.
- DOD Memorandum, *Ergonomics Program Requirements*, 4 February 1997.

### **E. U.S. Air Force Instructions (AFIs)**

A number of AFOSH STDs and AFIs have been used as sources for the checklist items. They are:

- AFI 37-138, *Record Disposition -- Procedures and Responsibilities*, 31 March 1994.
- AFI 91-204, *Safety Investigations and Reports*, 1 December 1996.
- AFOSH STD 48-1, *Respiratory Protection Program*, 25 February 1994. This standard implements OSHA standard 29 CFR 1910.134, *Respiratory Protection*, for Air Force installations.

- AFOSH STD 48-8, *Controlling Exposures to Hazardous Substances*, 21 April 1994. This standard requires the use of the most recent Threshold Limit Values published in *Threshold Limit Values for Chemical Substances and Physical Agents* by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (which is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.
- AFOSH STD 48-19, *Hazardous Noise Program*, 17 December 1993. This standard contains the Air Force's (AF's) minimum occupation health requirements with respect to the protection of workers from possible harmful effects caused by exposure to hazardous noise.
- AFOSH STD 161-20, *Hearing Conservation Program*, 15 October 1991. This standard establishes a program to protect AF personnel from the harmful effects of hazardous noise.
- AFOSH STD 161-21, *Hazard Communication*, 23 January 1989. This standard contains the AF's minimum requirements for an effective hazard communication program for those activities in the course of which hazardous materials are handled or used.

## F. Key Compliance Requirements

The purpose of the environmental/occupational health program is to minimize the loss of AF resources and to protect AF personnel from work-related deaths, injuries, and occupational illnesses by managing risks. The proper implementation of an aggressive and comprehensive environmental/occupational health program will result in a positive return on investment and an increase in readiness. Compliance with OSHA regulations is of secondary importance to the preservation of the health and safety of AF personnel and other resources; however, these regulations do serve as a benchmark for evaluating the effectiveness of the ANG's programs. DOD, AF, and ANG directives must be complied with, and should be given appropriate weight when considering the implementation of an occupational health program or hazard abatement project. A strong environmental/occupational health program is a vital element in the continued accomplishment of the ANG's mission.

The compliance requirements in this section are many and extremely varied. The regulations are often written in such a way that they apply only to installations that satisfy very specific conditions. It is highly unlikely that any one installation will have to demonstrate compliance with all the items in any particular major section of the protocol. The following discussion of key compliance requirements must be read with that fact in mind. Because certain compliance requirements are common to a number of areas of concern, the common requirements are broken out into lists first and then treated by topic area.

- Installations must carry out certain surveys, if required:
  1. annual surveys of identified industrial workplaces and of administrative areas
  2. exposure surveys for noise, ionizing radiation, air contaminants, non-ionizing radiation, and contact with hazardous substances
  3. surveys to identify permit-required confined spaces, if any
  4. exposure determination surveys for bloodborne pathogens
  5. investigations to determine and correct hazards associated with illnesses and injuries.
- Installations must conduct monitoring for the following:
  1. noise
  2. ionizing radiation
  3. air contaminants
  4. bloodborne pathogens.
- Installations must provide personal protective equipment when conditions require the use of it, and they must ensure that it is properly used and properly maintained. If the installation carries out activities that require the

use of respirators, a respiratory protection program must be developed. There must also be a training program for those individuals who must use respirators.

- Installations must provide their personnel with training that is appropriate to the hazards to which they may be occupationally exposed and to the PPE that they are required to use.
- Depending on circumstances, installations must develop certain plans and programs:
  1. hearing conservation program
  2. radiation protection program
  3. respiratory protection program
  4. permit space program
  5. compliance program for airborne contaminants
  6. exposure control plan for bloodborne pathogens.

Key compliance requirements can also be considered by topic area, as follows:

- With regard to the questions of ventilation (29 CFR 1910.94), installations must monitor air quality in areas where abrasive blasting takes place. They must also provide PPE under certain circumstances, and if that is necessary, they must also develop a respiratory protection program.
- Installations must evaluate the health effects of noise as part of baseline workplace surveys, annual workplace surveys, and when operations change or new operations are started. Installations must develop a hearing conservation program under certain circumstances and must track the noise exposure of those who participate in it. Installations must carry out exposure monitoring and provide PPE to those for whom it is necessary. Personnel must be trained, and the installation must retain documentation of that training along with records of exposure monitoring and audiometric tests, if such tests are necessary.
- Where exposure to ionizing radiation is a possibility, installations must conduct exposure surveys where required and provide and ensure the use of appropriate personnel monitoring equipment, if necessary. Personnel who work in or who frequent radiation areas must receive instructions and information. In addition, installations must maintain records of the radiation exposure of their personnel.
- Installations must evaluate workplaces in order to determine whether any qualify as permit-required confined spaces. If the installation has such spaces, it must develop a written permit space program. The installation must adequately train personnel who enter such spaces and personnel who function as attendants.
- With respect to air contaminants that are not regulated by their own OSHA Standard, the installation must ensure compliance with occupational exposure limits (OELs); if compliance cannot be ensured through the use of administrative and/or work practice controls, PPE must be provided. For all air contaminants, AFOSH STD 48-8, *Controlling Exposures to Hazardous Substances*, requires the use of the most recent Threshold Limit Values published in *Threshold Limit Values for Chemical Substances and Physical Agents* by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (which is updated annually) is to be followed **if no separate AFOSH STD has been issued for a particular substance**.
- The key compliance requirements for air contaminants that are regulated by their own OSHA Standard are quite similar in outline. Installations must monitor exposure of personnel who are or may be exposed above the OEL. A written compliance program must be developed if certain exposure levels are exceeded. Respirators must be provided if necessary, and a respiratory protection program must be developed and implemented. Personnel who are subject to occupational exposure must be trained. Installations may also find it necessary to institute medical surveillance programs under certain conditions. Records of exposure monitoring and medical surveillance must be retained.

- Those installations where exposure to bloodborne pathogens is a possibility must carry out an exposure determination. Installations where exposure is possible must develop a written exposure control plan, and personnel who work where exposure is possible must use universal precautions (see definitions). In addition, installations must train personnel who are subject to possible occupational exposure to bloodborne pathogens.
- All installations can reasonably expect to have to develop a written hazard communication program for some, if not all, of their industrial workplaces. Installations must also ensure the proper labelling of hazardous chemicals, and they must keep copies of material safety data sheets (MSDSs) for hazardous chemicals that are in use. Relevant hazard communication training must be provided to personnel who use hazardous chemicals.

## **G. Responsibility for Compliance**

The main burden of responsibility for compliance with the requirements contained in this section is carried by Bioenvironmental Engineering (BE) and Public Health (PH). Other organizations may become involved less frequently. The principle areas of responsibility are sketched in the following paragraphs:

- BE is responsible for conducting the baseline and annual surveys of identified industrial work places and baseline surveys of administrative areas. BE is also responsible for conducting monitoring for air contaminants, noise, and radiation, and for prescribing PPE when necessary. If written compliance programs are required for specific air contaminants, BE is responsible for developing them. BE is also responsible for maintaining the installation's file of MSDSs. In conjunction with base safety, BE evaluates work places to determine whether the installation has any permit-required confined spaces. BE and PH share responsibility for the development of respiratory protection programs, when they are required.
- In general, PH bears the responsibility in three main areas of compliance: carrying out medical surveillance, retaining records related to medical issues, and training personnel. PH is also responsible for carrying out the exposure determination for bloodborne pathogens and for developing the written exposure control plan.
- The environmental manager (EM) is responsible for developing the written safety and health plan that is required if base personnel engage in hazardous waste operations. EM is also responsible for the installation's written Emergency Response Plan.



## ENVIRONMENTAL/OCCUPATIONAL HEALTH

### Records To Review

- List of all industrial shops, including:
  1. Shop name
  2. Baseline survey dates
  3. Annual survey dates
  4. Point of contact
- Industrial hygiene casefiles (including Tab F) of identified industrial workplaces and administrative workplaces to include:
  1. Documentation of annual/baseline surveys
  2. Records of exposure surveys
  3. List of shops requiring quarterly ventilation surveys and supporting documents
  4. List of exposure groups (or shops) on the Respiratory Protection Program and supporting documents
  5. List of exposure groups (or shops) on the Ionizing/non-ionizing Radiation Program and supporting documents
- Thermoluminescent Dosimeter (TLD) Program Documentation
  1. AF Form 1499
  2. AF Form 1523
  3. AF Form 1527
- Occupational Health Surveillance Records (Medical Records)
- Documentation of occupational health training provided by BE/PH
  1. Hearing conservation (including audiometric test records)
  2. Respiratory protection
  3. Chemical hazard
  4. Hazard communication (HAZCOM)
- Records of exposure determinations for bloodborne pathogens to include exposure control plan
- Occupational health section of the latest unit ECAMP report and the status of any recommended corrective actions
- Miscellaneous
  1. Environmental differential pay entitlement records
  2. Base Hazard Abatement Log
  3. Log of Occupational Safety and Health Committee
  4. Minutes of Base Occupational Safety and Health Committee
  5. Minutes of the Aerospace Medicine Committee (and the Occupational Health Working Group, if applicable)
  6. Occupational health metrics
  7. Documents on the Permit-Required Confined Space Program
  8. Copies of Emergency Response Plans for Hazardous Materials

**Physical Features To Inspect**

- Industrial work places
- Dental and medical clinic facilities

**People To Interview**

- BE (Bioenvironmental Engineering)
- PH (Public Health)
- Shop Supervisors
- EM (Environmental Manager)
- CE (Civil Engineering)
- CC (Unit Commander)
- LE (Law Enforcement)
- SE (Base Safety)
- DEF (Fire Department)
- SGP (Chief of Professional Services)
- DP (Disaster Preparedness)
- LGC (Logistics--Contracts)
- LGS (Logistics--Supply)
- RPO (Radiation Protection Officer)

## ENVIRONMENTAL/OCCUPATIONAL HEALTH

### Root Causes

The following descriptors are used in filling out finding sheets under the protocols in this part of Volume 2 of the ANG Supplement:

- Personal Factors
  - P1 Insufficient training
  - P2 Lack of skill or experience
  - P3 Lack of motivation
  - P4 Competing priorities
- Organization Factors
  - O1 Inadequate procedures
  - O2 Procedures not available
  - O3 Inadequate local guidance
  - O4 Inadequate local scheduling
  - O5 Inadequate local planning
  - O6 Inadequate guidance from higher echelons
- Resource Factors
  - R1 Insufficient manpower available
  - R2 Insufficient funding available
  - R3 Insufficient material available
  - R4 Insufficient sampling and monitoring equipment available
- Equipment and Facility Factors
  - E1 Inadequate facility design or selection
  - E2 Inadequate facility maintenance
  - E3 Inadequate equipment selection
  - E4 Inadequate equipment maintenance
  - E5 Other equipment or facility factors
- External Factors
  - X1 Delays due to deployment
  - X2 Delays due to change of mission
  - X3 Delays due to personnel changes
  - X4 Delays due to other external factors

## Violation Types/Related Causes

The following descriptors are used in filling out finding sheets under the protocols in this part of Volume 2 of the ANG Supplement:

- Personal Factors

- P1 Operating without authority (Other)
- P2 Operating without authority -- Permits
- P3 Operating without authority -- Certification
- P4 Operating without authority -- Training
- P5 Failure to warn (Other)
- P6 Failure to warn -- Signs
- P7 Failure to warn -- Labels or tags
- P8 Failure to secure or lock out
- P9 Operating at improper speed
- P10 Making safety devices inoperable
- P11 Using defective equipment
- P12 Using defective PPE
- P13 Using equipment improperly
- P14 Using PPE improperly
- P15 Using incorrect equipment
- P16 Using incorrect PPE
- P17 Failure to use PPE
- P18 Maintaining PPE inadequately or improperly
- P19 Storing PPE inadequately or improperly
- P20 Improper loading or placement
- P21 Taking improper position
- P22 Servicing equipment in motion
- P23 Horseplay

- Conditions (ANSI Z16.2)

- C1 Inadequate guards or protection
- C2 Defective tools
- C3 Defective equipment
- C4 Defective tools
- C5 Defective substances
- C6 Congestion
- C7 Inadequate warning, interlock system
- C8 Fire and explosion hazards
- C9 Substandard housekeeping
- C10 Inadequate illumination
- C11 Inadequate ventilation
- C12 Hazardous exposures -- gases
- C13 Hazardous exposures -- dusts
- C14 Hazardous exposures -- fumes
- C15 Hazardous exposures -- vapors
- C16 Hazardous exposures -- smoke or other combination of contaminants
- C17 Hazardous exposures -- material contact or skin absorption
- C18 Hazardous exposures -- inadvertent ingestion (food contaminants, etc.)
- C19 Hazardous exposures -- noise
- C20 Hazardous exposures -- ionizing radiation
- C21 Hazardous exposures -- nonionizing radiation

C22 Hazardous exposures -- heat  
C23 Hazardous exposures -- cold  
C24 Hazardous exposures -- repetitive/awkward/forceful motion

- Risk Management

- M1 No baseline survey/inspection
- M2 Incomplete baseline survey/inspection
- M3 No annual survey/inspection
- M4 Incomplete annual survey/inspection
- M5 Uncharacterized hazard/exposure
- M6 Using respirators without training
- M7 Using respirators without fitting
- M8 Using respirators without medical qualification
- M9 Missing required physical examination
- M10 Inadequate physical examination
- M11 No fetal protection evaluation
- M12 Incomplete fetal protection evaluation

- Administrative

- 1. Reports

- A1 Missing exposure result reports
- A2 Missing physical exam reports
- A3 Other Inadequate or missing reports

- 2. Records

- A4 Inadequate training records
- A5 Inadequate sampling records
- A6 Inadequate medical records
- A7 Inadequate inspection/survey records
- A8 Other inadequate records



**ENVIRONMENTAL/OCCUPATIONAL HEALTH**  
**Acronym List**

<b>Acronym</b>	<b>Expansion</b>
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos-containing material
AEC	Atomic Energy Commission
AF	Air Force
AFLC	Air Force Logistics Command
AFOSH STD	Air Force Occupational Safety and Health Standard
AFI	Air Force Instruction
AFR	Air Force Regulation
AFSC	Air Force Systems Command
ALAR	as low as is reasonably achievable
AL	action level
ANG	Air National Guard
ANSI	American National Standards Institute
ARA	airborne radiation area
$\beta_2$ -M	beta-2 microglobulin in urine
CAS	Chemistry Abstracts Service
CDC	Centers for Disease Control and Prevention
CdB	cadmium in blood
CdU	cadmium in urine
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	continuous flow
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CO	carbon monoxide
CPR	cardiopulmonary resuscitation
D	demand
DAC	derived air concentration
dB	decibel
DFU	detailed follow-up
DFU-TS	detailed follow-up threshold shift
DOD	Department of Defense
DOP	dioctyl phthalate

Acronym	Expansion
DOT	Department of Transportation
FEV	forced expiratory volume
FHCTP	Federal Hazard Communication Test Program
FR	Federal Register
FVC	forced vital capacity
Gy	gray
HBV	hepatitis B virus
HEPA	high-efficiency particulate air (filter)
HIV	human immunodeficiency virus
HMIS	Hazardous Material Information System
HQ USAF	Headquarters, United States Air Force
HRA	high radiation area
H <sub>s</sub>	shallow dose equivalent
IARC	International Agency for Research on Cancer
ICS	Incident Command System
IDLH	immediately dangerous to life or health
ID No.	identification number
IH	industrial hygiene
ISFSI	independent spent fuel storage installation
IUPAC	International Union of Pure and Applied Chemistry
LFL	lower flammable limit
LLW	Low-Level Waste
LPG	liquefied petroleum gas
lwb	liters of whole blood
MAJCOM	Major Command
MAPP	methyl acetylene propadiene mixture
MC	methylene chloride
MCH	mean corpuscular hemoglobin
MCHC	mean corpuscular hemoglobin concentration
MCV	mean corpuscular value
MRPB	medical removal protection benefits
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NFA	noise free audiogram

<b>Acronym</b>	<b>Expansion</b>
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NP	negative pressure (i.e., negative phase during inhalation)
NPL	National Priority Site List
NRC	National Regulatory Commission
NTP	National Toxicology Program
NVLAP	National Volunteer Laboratory Accreditation Program
OEL	occupational exposure limits
OI	operating instructions
ORM	OSHA reference method
OSHA	Occupational Safety and Health Administration
PACM	presumed asbestos-containing material
PAPR	powered air purifying respirator
PCB	polychlorinated biphenyl
PD	pressure demand (i.e., always positive pressure)
PEL	permissible exposure limit
PL	Public Law
PNOR	particulates not otherwise regulated
PP	positive pressure
PPE	personal protective equipment
PTS	permanent threshold shift
RA	radiation area
RAC	risk assessment code
RCRA	Resource Conservation and Recovery Act
RD	demand, recirculating (closed circuit)
REIRS	Radiation Exposure Information and Reporting System
rem	roentgen equivalent in man
RP	pressure demand, recirculating (closed circuit)
SCBA	Self-Contained Breathing Apparatus
SI	International System of Units
SI	sievert (measurement)
SOP	standard operating procedure
STEL	short term exposure limit
STS	significant/standard threshold shift

<b>Acronym</b>	<b>Expansion</b>
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeters
TO	technical orders
TSDF	treatment, storage, and disposal facility
TSI	Thermal System Insulation
TWA	time-weighted average
USAF	U.S. Air Force
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
VHRA	very high radiation area
WL	working level
WLM	working level month

### Abbreviations

Bq	becquerel	mg	milligram
C	Celsius	mgd	million gallons per day
cc	cubic centimeters	μg	microgram
Ci	Curie	μm	micrometer
cm	centimeter	min	minute
cm <sup>2</sup>	square centimeter	mo	month
f	fiber	mm	millimeter
F	Fahrenheit	mm Hg	millimeters of Mercury
ft	feet	mrem	millirem
ft <sup>2</sup>	square feet	mSv	millisievert
ft <sup>3</sup>	cubic feet	MW	MegaWatt
g	gram	NTU	nephelometric turbidity unit
gal	gallons	pCi	picoCurie
gpd	gallons per day	ppm	parts per million
gpm	gallons per minute	ppmv	parts per million by volume
gr	grain	psi	pounds per square inch
gr/dscf	grain/dry standard cubic foot	psia	pounds per square inch absolute
h	hour	psig	pounds per square inch gauge
in.	inch	qt	quart
J	Joule	s	second
kg	kilogram	Sv	sievert
kPa	kiloPascal	V	volt
kW	kiloWatt	yr	year
L	liter		
lb	pound		
m	meter		
m <sup>2</sup>	square meter		
m <sup>3</sup>	cubic meter		
mi	mile		



## METRIC CONVERSION TABLE

The following conversion table may be used throughout this manual to make approximate conversions between U.S. units and metric.

1 in.	=	2.54 cm or 25.4 mm
1 ft	=	0.3048 m
1 ft <sup>2</sup>	=	0.093 m <sup>2</sup>
1 ft <sup>3</sup>	=	0.028 m <sup>3</sup>
1 psi	=	6.895 kPa
1 lb	=	0.454 kg
1 mi	=	1.61 km
1 gal	=	3.78 L
°F	=	(°C + 17.78) x 1.8
°C	=	0.55 (°F - 32)
1 yd	=	0.9144 m
1 Btu	=	4.184 kJ
1 acre	=	4046.9 m <sup>2</sup>
1 acre	=	0.405 hectare



## **CHAPTER 14**

### **BASIC PROGRAM ELEMENTS**

## CHAPTER 14

### EOH: BASIC PROGRAM ELEMENTS

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Industrial Hygiene* - that science and art devoted to the recognition, evaluation, and control of those environmental factors or stresses, arising in or from the workplace, which may cause sickness, impaired health and well-being, or significant discomfort and inefficiency among workers (DODI 6055.5, Enclosure 2, para A).
- *Industrial Hygienist* - (1) a DOD civilian employee who meets the requirements of the Office of Personnel Management's standard for the Industrial Hygiene GS-690 series, or (2) a DOD contractor who has a college or university degree or degrees in engineering, chemistry, physics, medicine, or related physical and biological sciences, and who, by virtue of special studies and training, has acquired competence in industrial hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities (a) to recognize the environmental factors and to understand their effect on human persons and their well-being; (b) to evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of those stresses in terms of ability to impair an individual's health and well-being; and (c) to prescribe methods to eliminate, control, or reduce such stresses when necessary to alleviate their effects, or (3) a military officer commissioned in the medical services or biomedical sciences corps with equivalent education, training, and experience as described above (DODI 6055.5, Encl. 2, para B).

(NOTE: While the above definitions do not include certification by the American Board of Industrial Hygiene, the DOD recognizes the need for such certification by every professional industrial hygienist as an appropriate hallmark by one's peers and strongly urges all eligible DOD personnel to obtain certification.)

- *Qualified Occupational Health Personnel* - medical personnel, such as physicians, nurses, sanitarians, etc., who by virtue of education, training, and experience have acquired competence in industrial hygiene and occupational health (DODI 6055.5, Encl. 2, para C).



## **EOH: BASIC PROGRAM ELEMENTS**

### **GUIDANCE FOR CHECKLIST USERS**

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	BE.10.1 through BE.10.14	14-5
Medical Surveillance	BE.20.1 through BE.20.5	14-9
Hazard Abatement	BE.30.1 through BE.30.10	14-11
Illness Investigation	BE.40.1 through BE.40.5	14-15
Documentation	BE.50.1 through BE.50.9	14-17
Medical Services and First Aid	BE.60.1 through BE.60.3	14-19

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.10 GENERAL REQUIREMENTS</b></p> <p><b>BE.10.1.</b> Work areas and processes must be free from recognized hazards that cause or are likely to cause death or serious physical harm (29 CFR 1960.8(a) and 1960.9).</p> <p><b>BE.10.2.</b> Comprehensive periodic evaluations of all potential health hazards in each workplace and ancillary facilities must be conducted (DODI 6055.5, para F.1.a.(1)).</p> <p><b>BE.10.3.</b> All areas and operations of each work-place must be evaluated at least annually (29 CFR 1960.25(a), 29 CFR 1960.25(c), and DODI 6055.1, Encl. 2, para</p>	<p>Verify that the installation's work areas and processes are free from recognized hazards that are causing or are likely to cause death or serious physical harm. (3)(8)</p> <p>(NOTE: A finding under this checklist item must meet five conditions:</p> <ul style="list-style-type: none"> <li>- There must be a hazard (i.e., a danger which threatens physical harm to employees). This is not necessarily the lack of a particular abatement method or precaution. There must be a source of chemical, physical, ergonomic, or biological harm.</li> <li>- The hazard must be reasonably foreseeable. If there is evidence in a medical record, injury log, or illness log that harm has (or may have) resulted from a workplace exposure, then the hazard is reasonably foreseeable.</li> <li>- The hazard must affect ANG members or ANG employees.</li> <li>- The hazard must be recognized. Recognition of a hazard can be established on the basis of industry recognition (a consensus standard exists), employer recognition (written or oral evidence), or "common-sense". If there is evidence in a medical record, injury log, or illness log that harm has (or may have) resulted from a workplace exposure, then recognition is established.</li> <li>- The hazard must be correctable by a feasible and useful method.)</li> </ul> <p>(NOTE: A "General Duty" finding should not be used where specific OSHA or AFOSH Standards exist that cover the hazard. this finding is used for musculo-skeletal disorders, heat stress, cold stress, or other hazards that have no specific regulatory standard.)</p> <p>Verify that comprehensive periodic evaluations of all potential health hazards in each workplace and ancillary facilities are conducted to ensure that workers are not exposed to recognized physical, chemical, or biological hazards that could cause death or illness.</p> <p>(NOTE: A comprehensive evaluation may be considered current and complete if the <u>potential</u> occupational health hazards associated with the routine and non-routine tasks done in a shop have been identified.)</p> <p>Verify that each work area and process is evaluated at least annually.</p> <p>(NOTE: This requirement applies to all areas and operations, including office operations.)</p>

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<p>3.a.(1)).</p> <p><b>BE.10.4.</b> Information must be provided to personnel who conduct inspections (29 CFR 1960.26(a)(1) and 1960.71(a)).</p> <p><b>BE.10.5.</b> Workplace evaluations must be conducted by certain persons only (DODI 6055.5, para F.1.a.(2) and DODI 6055.1, Encl. 2, para 3.a.(2)).</p> <p><b>BE.10.6.</b> Personnel who conduct inspections must be provided with appropriate test equipment (DODI 6055.1, Encl. 2, para 3.a.(2)).</p>	<p>(NOTE: An evaluation by BE need not be carried out annually in a non-industrial workplace if:</p> <ul style="list-style-type: none"> <li>- BE has determined that the safety or fire representative who inspects the work area can recognize potential sources of occupational health hazards. and</li> <li>- the safety or fire representative agrees to contact BE when these sources or any other occupational health concerns are encountered.)</li> </ul> <p>Verify that more frequent inspections are conducted in all areas where there is an increased risk of accident, injury, or illness due to the nature of the work performed.</p> <p>(NOTE: Sufficient unannounced follow-up inspections should be conducted to ensure the identification and abatement of hazardous conditions.)</p> <p>Verify that all available relevant information which pertains to the occupational safety and health of the workplace to be inspected is made available prior to the survey.</p> <p>(NOTE: This requirement includes, but is not limited to, the following:</p> <ul style="list-style-type: none"> <li>- safety and health hazard reports</li> <li>- injury and illness records</li> <li>- previous inspection reports</li> <li>- reports of unsafe and unhealthful working conditions.)</li> </ul> <p>Verify that workplace evaluations are conducted by the following persons only:</p> <ul style="list-style-type: none"> <li>- industrial hygienists</li> <li>- qualified occupational health personnel</li> <li>- technicians under the supervision of industrial hygienists.</li> </ul> <p>(NOTE: In the ANG an IH technician may be considered to work under the supervision of industrial hygienist if there is clear evidence that the Aerospace Medicine Council -- or an ad hoc group that reports to the Aerospace Medicine Council -- reviews the surveillance approach and the results.)</p> <p>Verify that the personnel who conduct inspections are provided with appropriate test equipment.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.10.7.</b> Inspectors must consult with authorized employee representatives on matters affecting the employees' safety and health (DODI 6055.1, Encl. 2, para 3.a.(4)).</p>	<p>Verify that inspectors consult with authorized employee representatives on matters affecting the employees' safety and health.</p> <p>(NOTE: In the absence of authorized employee representatives, the inspectors consult with workplace personnel on these matters.)</p>
<p><b>BE.10.8.</b> The comprehensive periodic evaluation of a workplace must result in a definite determination as to the presence, absence, or degree of health hazard from the use of each chemical, physical, and biological agent (DODI 6055.5, para F.1.a.(2)).</p>	<p>Verify that the comprehensive periodic evaluation of a workplace results in a definite determination as to the presence, absence, or degree of health hazard from the use of each chemical, physical, and biological agent in that workplace.</p>
<p><b>BE.10.9.</b> For each chemical used in the workplace, a professional judgment must be made as to the health hazard associated with the use of that chemical (DODI 6055.5, para F.1.a.(1)).</p>	<p>Verify that, for each chemical used in the workplace, a professional judgment is made as to the health hazard associated with the use of that chemical.</p> <p>(NOTE: In many cases, this judgment can be made by reviewing the chemical and physical characteristics of the material and the manner in which it is used; MSDSs are valuable in this regard. In certain instances, however, sampling may be necessary to ascertain potential exposures.)</p>
<p><b>BE.10.10.</b> Monitoring must meet the requirements of applicable OSHA standards or approved DOD alternate or supplemental standards (DODI 6055.5, para F.1.a.(2)).</p>	<p>Verify that monitoring meets the requirements of applicable OSHA standards or approved DOD alternate or supplemental standards.</p>
<p><b>BE.10.11.</b> Affected DOD personnel or civilian employee representatives must be advised of the monitoring procedures and have access to the results (DODI 6055.5, para F.1.a.(2)).</p>	<p>Verify that affected DOD personnel or civilian employee representatives are advised of the monitoring procedures and have access to the results.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>BE.10.12.</b> Determinations as to the health hazards represented by agents and the results of any monitoring must form the basis of an overall assessment of the health hazards in each workplace (DODI 6055.5, para F.1.a.(3)).	Verify that determinations as to the health hazards represented by agents (physical, chemical, and/or biological) and the results of any monitoring form the basis of an overall assessment of the health hazards in each workplace.
<b>BE.10.13.</b> Overall assessments of the health hazards in each workplace must be used for certain specific purposes (DODI 6055.5, para F.1.a.(3)).	Verify that overall assessments of the health hazards in each workplace are used to: <ul style="list-style-type: none"> <li>- assign priorities for abatement actions</li> <li>- schedule future surveys</li> <li>- require PPE</li> <li>- provide a basis for determining the requirement for and the scope of periodic medical surveillance of workers.</li> </ul>
<b>BE.10.14.</b> Employee reports or complaints of unhealthy conditions must be investigated on a specific timetable (29 CFR 1960.28(d)(3)).	Verify that employee reports or complaints of unhealthy conditions are investigated as follows: <ul style="list-style-type: none"> <li>- within 24 h for reports of imminent danger conditions</li> <li>- within 3 working days for potentially serious conditions</li> <li>- within 20 working days for safety and health conditions that are other than serious.</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.20 MEDICAL SURVEILLANCE</b></p> <p><b>BE.20.1.</b> Medical surveillance programs must include certain medical examination requirements (DODI 6055.5, para F.1.b.(1)).</p> <p><b>BE.20.2.</b> The medical examinations of exposed workers must include specific elements (DODI 6055.5-M, para C.1.b).</p> <p><b>BE.20.3.</b> Industrial hygiene assessments must be used to determine the scope of medical surveillance of workers (DODI 6055.5, para F.1.a.(3)).</p> <p><b>BE.20.4.</b> Appropriate medical examinations must be given to workers under certain conditions, even when there is no OSHA or other regulatory requirement to do so (DODI 6055.5-M, para C.2.a.(2)(d)).</p>	<p>Verify that the medical surveillance program includes the medical examination requirements of the following:</p> <ul style="list-style-type: none"> <li>- OSHA standards</li> <li>- alternate DOD standards approved under Executive Order 12196</li> <li>- supplemental DOD standards for which no OSHA standard exists</li> <li>- Office of Personnel Management</li> <li>- other Federal agencies.</li> </ul> <p>Verify that the medical examinations of exposed workers include at least the following elements:</p> <ul style="list-style-type: none"> <li>- a medical history</li> <li>- clinical and biological screening tests</li> <li>- physical examinations.</li> </ul> <p>Verify that the Aerospace Medicine Council -- or an ad hoc group that reports to the Aerospace Medicine Council -- reviews the survey reports or summaries in determining the appropriate medical surveillance of workers.</p> <p>Determine whether any of the following conditions exists:</p> <ul style="list-style-type: none"> <li>- workers are protected from exceeding recommended exposure limits by respirators</li> <li>- unprotected workers are exposed to 50 percent or more of a recommended exposure limit</li> <li>- significant concern exists regarding absorption via the skin</li> <li>- workers are known to have been severely exposed during emergency situations.</li> </ul> <p>Verify that appropriate medical examinations are given in the above circumstances.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.20.5.</b> Whenever nonmandated medical surveillance examinations are deemed inappropriate or of little value, the rationale for the decision must be documented (DODI 6055.5-M, para C.2 a.(2) (e)).</p>	<p>Verify that, whenever nonmandated medical surveillance examinations are deemed inappropriate or of little value, the rationale for the decision is documented.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.30</b>  <b>HAZARD ABATEMENT</b></p> <p><b>BE.30.1.</b> Imminent danger situations discovered during inspections must be brought to the immediate attention of affected employees and appropriate supervisors (DODI 6055.1, para 3.a.(5)).</p> <p><b>BE.30.2.</b> In the event of an imminent danger situation, immediate measures must be taken to eliminate or reduce the hazard or to cease operations and withdraw exposed personnel (DODI 6055.1, para 3.a.(5)).</p> <p><b>BE.30.3.</b> A Notice of Unsafe or Unhealthful Working Conditions must be written for each RAC 1, 2, or 3 hazard that is not corrected immediately (DODI 6055.1, Encl. 2, para 3.a.(6)(a)).</p> <p><b>BE.30.4.</b> Notices of Unsafe or Unhealthful Working Conditions must meet specific requirements (29 CFR 1960.26(c)(2)).</p> <p><b>BE.30.5.</b> Notices of Unsafe or Unhealthful Working Conditions must be posted in accordance with specific requirements (29 CFR 1960.26(c)(3)).</p>	<p>Verify that imminent danger situations discovered during inspections are brought to the immediate attention of affected employees and appropriate supervisors.</p> <p>Verify that, in the event of an imminent danger situation, immediate measures are taken to eliminate or reduce the hazard or to cease operations and withdraw exposed personnel.</p> <p>Verify that a Notice of Unsafe or Unhealthful Working Conditions is written for each RAC 1, 2, or 3 hazard that is not corrected immediately.</p> <p>Verify that the notice is in writing and describes with particularity the nature and degree of seriousness of the unsafe or unhealthful working condition.</p> <p>Verify that the notice includes a reference to the standard or other requirement involved.</p> <p>Verify that the notice fixes a reasonable time for abatement of the unsafe or unhealthful working condition.</p> <p>Verify that Notices of Unsafe or Unhealthful Working Conditions (or copies thereof) are posted at or near each place an unsafe or unhealthful working condition referred to in the notice exists or existed.</p> <p>Verify that, if it is not practicable to post the notice at or near each workplace because of the nature of the workplace operations, such notice is posted in a prominent place where it will be readily observable by all affected employees.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.30.6.</b> The procedures for correcting unsafe or unhealthful working conditions must include a follow-up, to the extent necessary, to determine whether the correction was made (29 CFR 1960.30(b)).</p> <p><b>BE.30.7.</b> Certain hazards must be must be recorded in a formal installation hazard abate-ment plan (DODI 6055.1, Encl. 2, para 5.b.(5)).</p> <p><b>BE.30.8.</b> RAC 1, 2, and 3 hazards must be funded and abated as soon as practical on a worst-first basis (DODI 6055.1, Encl. 2, paras 5.b.(3) and 5.b.(8).(a)).</p> <p><b>BE.30.9.</b> Deficiencies with RACs 4 or 5 must be abated during scheduled repair or replacement (DODI 6055.1, Encl. 2, para 5.b.(4)).</p>	<p>(NOTE: For example, where workplace activities are physically disperse, the notice may be posted at the location to which employees report each day. Where employees do not primarily work at or report to a single location, the notice may be posted at the location from which the employees operate to carry out their activities.)</p> <p>Verify that, in addition, a notice is posted if any special procedures are in effect.</p> <p>Verify that Notices of Unsafe or Unhealthful Working Conditions are posted unedited, except for reasons of national security.</p> <p>Verify that the procedures for correcting unsafe or unhealthful working conditions include a follow-up, to the extent necessary, to determine whether the correction was made.</p> <p>Determine whether both of the following conditions are met:</p> <ul style="list-style-type: none"> <li>- the hazard has been assigned a RAC 1, 2, 3</li> <li>- the hazard requires more than 30 days for correction.</li> </ul> <p>Verify that such hazards are recorded in a formal installation hazard abatement plan.</p> <p>Verify that RAC 1, 2, and 3 hazards are funded and abated as soon as practical on a worst-first basis.</p> <p>Verify that deficiencies with RACs 4 or 5 are abated during scheduled repair or replacement.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<b>BE.30.10.</b> Hazards that cannot be abated within the authority or resources of the base must be identified to a higher authority (29 CFR 1960.30(d)).	Verify that hazards that cannot be abated within the authority or resources of the base are identified to a higher authority.



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.40</b>  <b>ILLNESS</b>  <b>INVESTIGATION</b></p> <p><b>BE.40.1.</b> Within 6 days after receiving information of an occupational injury or illness, appropriate information must be entered on the installation's log of occupational injuries and illnesses (29 CFR 1960.67(b)).</p> <p><b>BE.40.2.</b> PH must initiate an AF Form 190, <i>Occupational Illness/ Injury Report</i>, for each suspected and confirmed occupational illness (AFI 91-204, para 4.12.2.1).</p> <p><b>BE.40.3.</b> Specific actions must be taken once an occupational illness is confirmed (AFI 91-204, para 4.12.2.1).</p> <p><b>BE.40.4.</b> PH must log certain information on AF Form 739 and forward a copy to the base safety office (AFI 91-204, para 4.12.2.2).</p>	<p>Verify that appropriate information concerning an occupational injury or illness is entered on the installation's log of occupational injuries and illnesses within 6 days of receiving information of that occupational injury or illness.</p> <p>Verify that PH initiates an AF Form 190, <i>Occupational Illness/Injury Report</i>, for each suspected or confirmed occupational illness.</p> <p>Verify that PH forwards a completed AF Form 190 to the healthcare provider for filing in the patient's medical records.</p> <p>Verify that a copy of the completed AF Form 190 is sent to the Occupational Illness and Data Registry at AL/OEMO, Brooks AFB, TX 78235-5000.</p> <p>Verify that the patient's name, Social Security Account Number, diagnosis, and the date are entered into an occupational illness log maintained by PH.</p> <p>Verify that PH logs the following types of information on AF Form 739:</p> <ul style="list-style-type: none"> <li>- CA-2s, Notice of Occupational Disease and Claim for Compensation</li> <li>- CA-6s, Official Superior's Report of Employee's Death</li> <li>- claims</li> <li>- any confirmed occupational illness in civilian workers detected through its medical surveillance system.</li> </ul> <p>Verify that a copy of the AF Form 739 is forwarded to the base safety office no later than the third working day of each month.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<b>BE.40.5.</b> Data must be maintained on lost duty days that are due to occupational illness and injury (AFPD 48-1, para A.1.1.1).	Verify that PH collects and analyzes data on lost duty days that are due to occupational illnesses and injuries.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.50</b> <b>DOCUMENTATION</b></p> <p><b>BE.50.1.</b> Reports on occupational health surveys must be written to the shop supervisor and to the employee representative who participated in the closing conference (if any) (29 CFR 1960.26(c)(2) and DODI 6055.1, Encl. 2, para 3.a.(7)).</p> <p><b>BE.50.2.</b> Written reports of workplace inspections must be retained on file until the deficiencies have been corrected and for at least 5 yr thereafter DODI 6055.1, Encl. 2, para 3.a.(7)).</p> <p><b>BE.50.3.</b> Certain records and reports maintained for the occupational health program must be retained for specified periods of time (29 CFR 1960.73).</p> <p><b>BE.50.4.</b> Comprehensive baseline industrial hygiene data must be collected and maintained on each workplace and must be updated through periodic surveys (DODI 6055.5, para F.6.c.(1)).</p> <p><b>BE.50.5.</b> Sufficient records must be maintained on each workplace to ascertain the presence or absence, nature, and degree of its occupational health hazards (DODI 6055.5, para F.6.c.(2)).</p>	<p>Verify that reports on occupational health surveys are written to the shop supervisor and to the employee representative who participated in the closing conference (if any).</p> <p>Verify that such reports are written within 30 days of the completion of the investigation or survey.</p> <p>Verify that these reports are forwarded to functional managers or commanders to ensure correction of deficiencies.</p> <p>Verify that written reports of workplace inspections are retained on file until the deficiencies have been corrected and for at least 5 yr thereafter.</p> <p>Verify that occupational health records and reports that are not in the case file are retained for 5 yr following the end of the fiscal year to which they relate.</p> <p>Verify that comprehensive baseline industrial hygiene data are collected and maintained on each workplace.</p> <p>Verify that these comprehensive baseline industrial hygiene data are updated through periodic surveys.</p> <p>Verify that sufficient records are maintained on each workplace to ascertain the presence or absence, nature, and degree of its occupational health hazards.</p> <p>Verify that these records generally contain the following:</p> <ul style="list-style-type: none"> <li>- noise measurements</li> <li>- heat stress information</li> <li>- ventilation data</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.50.6.</b> Records of industrial hygiene work-place monitoring and surveys must be maintained for a minimum of 40 yr (DODI 6055.5, para F.6.c.(4)).</p> <p><b>BE.50.7.</b> Copies of exposure records must be kept in each exposed employee's Employee Medical Folder (EMF) (DODI 6055.5, para F.6.c.(4)).</p> <p><b>BE.50.8.</b> The results of medical examinations must be documented and stored in the worker's medical record (DODI 6055.5-M, para C.1.b).</p> <p><b>BE.50.9.</b> The EMFs of civilian employees must conform with Federal Personnel Manual Supplement 293-31, subchapter S6 (DODI 6055.5, para F.6.a.(1)).</p>	<ul style="list-style-type: none"> <li>- floor diagrams of the shop area</li> <li>- a detailed inventory of workplace toxic substances</li> <li>- a register of personnel occupationally exposed to chemical substances or other hazardous physical or biological stresses.</li> </ul> <p>Verify that industrial hygiene case file information is maintained for a minimum of 40 yr.</p> <p>Verify that environmental data with implications for personnel exposure are maintained in the industrial hygiene case file.</p> <p>Verify that copies of exposure records are kept in each exposed employee's EMF.</p> <p>Verify that the results of medical examinations are documented and stored in the worker's medical record.</p> <p>Verify that the EMFs of civilian employees conform with Federal Personnel Manual Supplement 293-31, subchapter S6.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BE.60</b>  <b>MEDICAL SERVICES AND FIRST AID</b></p> <p><b>BE.60.1.</b> Employers must ensure the readily availability of medical personnel for advice and consultation (29 CFR 1910.151(a)).</p> <p><b>BE.60.2.</b> Certain work-places must contain persons trained in first aid and approved first aid supplies (29 CFR 1910.151(b)).</p> <p><b>BE.60.3.</b> The installation must provide quick drenching/flushing facilities in certain situations (29 CFR 1910.151(c)).</p>	<p>Verify that the employer ensures the ready availability of medical personnel for advice and consultation on matters of installation health.</p> <p>Determine whether there is an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees.</p> <p>Verify that, in the absence of such a facility, a person or persons is adequately trained to render first aid.</p> <p>Verify that first aid supplies are approved by the consulting physician are readily available.</p> <p>Verify that such first aid supplies are readily available.</p> <p>Determine whether the eyes or body of any person could be exposed to injurious corrosive materials.</p> <p>Verify that, in such situations, suitable facilities for quick drenching or flushing of the eyes and body is provided within the work area for immediate emergency use.</p>



## **CHAPTER 15**

### **EXPOSURE AND MEDICAL RECORDS**

## CHAPTER 15

### EOH: EXPOSURE AND MEDICAL RECORDS

#### ECAMP-ANG

September 1997

#### Applicability

This section applies to:

- each general industry, maritime, and construction employer who makes, maintains, contracts for, or has access to employee exposure or medical records, or analyses thereof, pertaining to employees exposed to toxic substances or harmful physical agents
- all employee exposure and medical records, and analyses thereof, of such employees, whether or not the records are mandated by specific occupational safety and health standards
- all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis.

Each employer must ensure that the preservation and access requirements of this section are complied with regardless of the manner in which records are made or maintained.

#### Compliance Definitions

- *Access* - the right and opportunity to examine and copy (29 CFR 1910.1020(c)(1)).
- *Analysis Using Exposure or Medical Records* - any compilation of data or any statistical study based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis (29 CFR 1910.1020(c)(2)).
- *Designated Representative* - any individual or organization to whom an employee gives written authorization to exercise a right of access. For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization (29 CFR 1910.1020(c)(3)).
- *Employee* - a current employee, a former employee, or an employee being assigned or transferred to work where there will be exposure to toxic substances or harmful physical agents. In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section (29 CFR 1910.1020(c)(4)).
- *Employee Exposure Record* - a record containing any of the following kinds of information (29 CFR 1910.1020(c)(5)):
  1. Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained
  2. Biological monitoring results which directly assess the absorption of a toxic substance or harmful physical agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.)

but not including results which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs

3. Material safety data sheets (MSDSs) indicating that the material may pose a hazard to human health
  4. In the absence of an MSDS, a chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.
- *Employee Medical Record* - a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel, or technician, including (29 CFR 1910.1020(c)(6)):
    1. Medical and employment questionnaires or histories (including job description and occupational exposures)
    2. The results of medical examinations (pre-employment, pre-assignment, periodic, or episodic) and laboratory tests (including chest and other x-ray examinations taken for the purpose of establishing a baseline or detecting occupational illnesses and all biological monitoring not defined as an employee exposure record)
    3. Medical opinions, diagnoses, progress notes, and recommendations
    4. First aid records
    5. Descriptions of treatments and prescriptions
    6. Employee medical complaints.

(NOTE: This term does not include medical information in the form of:

1. Physical specimens (e.g., blood or urine samples) which are routinely discarded as a part of normal medical practice
  2. Records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., social security number, payroll number, etc.)
  3. Records created solely in preparation for litigation which are privileged from discovery under the applicable rules of procedure or evidence
  4. Records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.)
- *Employer* - means a current employer, a former employer, or a successor employer (29 CFR 1910.1020(c)(7)).
  - *Exposure* or *Exposed* - means that an employee is subjected to a toxic substance or harmful physical agent in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes past exposure and potential (e.g., accidental or possible) exposure, but does not include situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from typical non-occupational situations (29 CFR 1910.1020(c)(8)).
  - *Exposure Record Relevant to the Employee* - an exposure record relevant to an employee consists of (29 CFR 1910.1020(e)(2)(i)(A){1} through (e)(2)(i)(A){3}):
    1. A record which measures or monitors the amount of a toxic substance or harmful physical agent to which the employee is or has been exposed
    2. In the absence of such directly relevant records, such records of other employees with past or present job duties or working conditions related to or similar to those of the employee to the extent necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents to which the employee is or has been subjected
    3. Exposure records to the extent necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents at workplaces or under working conditions to which the employee is being assigned or transferred.

- *Health Professional* - means a physician, occupational health nurse, industrial hygienist, toxicologist, or epidemiologist, providing medical or other occupational health services to exposed employees (29 CFR 1910.1020(c)(9)).
- *Record* - any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, x-ray film, or automated data processing) (29 CFR 1910.1020(c)(10)).
- *Specific Chemical Identity* - a chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance (29 CFR 1910.1020(c)(11)).
- *Specific Written Consent* - a written authorization containing the following (29 CFR 1910.1020(c)(12)):
  1. The name and signature of the employee authorizing the release of medical information
  2. The date of the written authorization
  3. The name of the individual or organization that is authorized to release the medical information
  4. The name of the designated representative (individual or organization) that is authorized to receive the released information
  5. A general description of the medical information that is authorized to be released
  6. A general description of the purpose for the release of the medical information
  7. A date or condition upon which the written authorization will expire (if less than 1 yr).

(NOTE: A written authorization does not operate to authorize the release of medical information not in existence on the date of written authorization, unless the release of future information is expressly authorized, and does not operate for more than 1 yr from the date of written authorization.)

(NOTE: A written authorization may be revoked in writing prospectively at any time.)

- *Toxic Substance or Harmful Physical Agent* - any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo- or hyperbaric pressure, etc.) which either (29 CFR 1910.1020(c)(13)):
  1. Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) which is incorporated by reference as specified in Sec. 1910.6
  2. Has yielded positive evidence of an acute or chronic health hazard in testing conducted by, or known to, the employer
  3. Is the subject of a material safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.
- *Trade Secret* - any confidential formula, pattern, process, device, or information or compilation of information that is used in an employer's business and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it (29 CFR 1910.1020(c)(13)).



**EOH: MEDICAL RECORDS**  
**GUIDANCE FOR CHECKLIST USERS**

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Preservation of Records	RK.10.1 through RK.10.4	15-7
Access to Records		
General	RK.20.1 and RK.20.2	15-9
Employee and Designated Representative Access	RK.30.1 through RK.30.4	15-11
OSHA Access	RK.40.1 and RK.40.2	15-13
Employee Information	RK.50.1 and RK.50.2	15-15
Transfer of Records	RK.60.1	15-17

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>RK.10</b>  <b>PRESERVATION OF RECORDS</b></p> <p><b>RK.10.1.</b> The medical record for each employee must be preserved and maintained in accordance with specific requirements (29 CFR 1910.1020(d)(1)(i)).</p> <p><b>RK.10.2.</b> Each employee exposure record must be preserved and maintained for at least 30 yr (29 CFR 1910.1020(d)(1)(ii) and (d)(1)(iii)).</p>	<p>(NOTE: The requirements of RK.10 apply unless a specific occupational safety and health standard provides a different period of time for preservation or retention of records.)</p> <p>(NOTE: Nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record so long as the information contained in the record is preserved and retrievable, except that chest x-ray films must be preserved in their original state.)</p> <p>(NOTE: An interpretation of 29 CFR 1910.1020(d) requires that environmental data with implications for personnel exposure be maintained in the industrial hygiene case file.)</p> <p>Verify that the medical record for each employee is preserved and maintained for at least the duration of employment plus 30 yr.</p> <p>(NOTE: The following types of records need not be retained for any specified period:</p> <ul style="list-style-type: none"> <li>- health insurance claims records maintained separately from the employer's medical program and its records</li> <li>- first aid records (not including medical histories) of one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and the like which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job, if made on-site by a non-physician and if maintained separately from the employer's medical program and its records</li> <li>- the medical records of employees who have worked for less than 1 yr for the employer need not be retained beyond the term of employment if they are provided to the employee upon the termination of employment.)</li> </ul> <p>Verify that each employee exposure record is preserved and maintained for at least 30 yr.</p> <p>(NOTE: Background data to environmental (workplace) monitoring or measuring, such as laboratory reports and worksheets, need only be retained for 1 yr so long as the sampling results, the collection methodology (sampling plan), a description of the analytical and mathematical methods used, and a summary of other background data relevant to interpretation of the results obtained, are retained for at least 30 yr.)</p> <p>(NOTE: Material safety data sheets and, in their absence, records concerning the identity of a substance or agent need not be retained for any specified period as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for at least 30 yr.)</p>

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<p><b>RK.10.3.</b> Each analysis using exposure or medical records must be preserved and maintained for at least 30 yr (29 CFR 1910.1020(d)(1)(iii)).</p> <p><b>RK.10.4.</b> Chest x-ray films must be preserved in their original state (29 CFR 1910.1020(d)(2)).</p>	<p>(NOTE: Biological monitoring results designated as exposure records by specific occupational safety and health standards must be preserved and maintained as required by the specific standard.)</p> <p>Verify that each analysis using exposure or medical records is preserved and maintained for at least 30 yr.</p> <p>Verify that chest x-ray films are preserved in their original state.</p>

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<p><b>ACCESS TO RECORDS</b></p> <p><b>RK.20</b> <b>General</b></p> <p><b>RK.20.1.</b> Whenever an employee or designated representative requests access to a record, the employer must ensure that access is provided in a reasonable time, place, and manner (29 CFR 1910.1020(e)(1)(i) and (e)(1)(iii)).</p> <p><b>RK.20.2.</b> Employers must meet specific requirements whenever an employee or designated representative requests a copy of a record (29 CFR 1910.1020(e)(1)(iii) through (e)(1)(v)).</p>	<p>Verify that, whenever an employee or designated representative requests access to a record, the employer provides that access in a reasonable time, place, and manner.</p> <p>Verify that, if the employer cannot reasonably provide access to the record within 15 working days, the employer apprises the employee or designated representative requesting the record of the following within 15 working days:</p> <ul style="list-style-type: none"> <li>- reason for the delay</li> <li>- the earliest date when the record can be made available.</li> </ul> <p>(NOTE: The employer may require of the requester only such information as should be readily known to the requester and which may be necessary to locate or identify the records being requested (e.g., dates and locations where the employee worked during the time period in question).)</p> <p>Verify that, whenever an employee or designated representative requests a copy of a record, the employer ensures that either:</p> <ul style="list-style-type: none"> <li>- a copy of the record is provided without cost to the employee or representative</li> <li>- the necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record</li> <li>- the record is loaned to the employee or representative for a reasonable time to enable a copy to be made.</li> </ul> <p>(NOTE: In the case of an original x-ray, the employer may restrict access to on-site examination or make other suitable arrangements for the temporary loan of the x-ray.)</p> <p>(NOTE: Whenever a record has been previously provided without cost to an employee or designated representative, the employer may charge reasonable, non-discriminatory administrative costs (i.e., search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record, except that:</p> <ul style="list-style-type: none"> <li>- an employer must not charge for an initial request for a copy of new information that has been added to a record which was previously provided</li> <li>- an employer must not charge for an initial request by a recognized or certi-</li> </ul>

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	<p>             fied collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.           </p> <p>             (NOTE: Nothing in this section is intended to preclude employees and collective bargaining agents from collectively bargaining to obtain access to information in addition to that available under this section.)           </p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>ACCESS TO RECORDS</b></p> <p><b>RK.30</b>  <b>Employee and Designated Representative Access</b></p> <p><b>RK.30.1.</b> Each employer must, upon request, ensure to each employee and designated representative access to employee exposure records relevant to the employee (29 CFR 1910.1020(e)(2)(i)(A) and (e)(2)(i)(B)).</p> <p><b>RK.30.2.</b> Each employer must, upon request, ensure the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent (29 CFR 1910.1020(e)(2)(ii)(B) through (e)(2)(ii)(E)).</p>	<p>Verify that, upon request, the employer ensures to each employee and designated representative access to exposure records relevant to the employee.</p> <p>(NOTE: A series of exemptions relating to the disclosure of trade secrets is ignored here and in what follows. The material may be found at 29 CFR 1910.1020(f).)</p> <p>(NOTE: Requests by designated representatives for unconsented access to employee exposure records must be in writing and must specify with reasonable particularity both of the following:</p> <ul style="list-style-type: none"> <li>- the record requested to be disclosed</li> <li>- the occupational health need for gaining access to these records.)</li> </ul> <p>Verify that, upon request, the employer ensures the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent.</p> <p>(NOTE: Appendix A to 29 CFR 1910.1020 contains a sample form that may be used to establish specific written consent for access to employee medical records.)</p> <p>(NOTE: Whenever access to employee medical records is requested, a physician representing the employer may recommend that the employee or designated representative:</p> <ul style="list-style-type: none"> <li>- consult with the physician for the purposes of reviewing and discussing the records requested</li> <li>- accept a summary of material facts and opinions in lieu of the records requested</li> <li>- accept release of the requested records only to a physician or other designated representative.)</li> </ul> <p>(NOTE: Whenever an employee requests access to his or her employee medical records, and a physician representing the employer believes that direct employee access to information contained in the records regarding a specific diagnosis of a terminal illness or a psychiatric condition could be detrimental to the employee's health, the employer may inform the employee that access will only be provided to a designated representative of the employee having specific written consent, and deny the employee's request for direct access to this information only.)</p>

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<p><b>RK.30.3.</b> Each employer must, upon request, ensure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace (29 CFR 1910.1020(e)(2)(iii)(A)).</p> <p><b>RK.30.4.</b> Employers must under certain circumstances ensure that personal identifiers are removed from any analysis that reports the contents of employee medical records (29 CFR 1910.1020(e)(2)(iii)(B)).</p>	<p>Verify that, when a designated representative with specific written consent requests access to information so withheld, the employer ensures the access of the designated representative to this information, even when it is known that the designated representative will give the information to the employee.</p> <p>(NOTE: A physician, nurse, or other responsible health care personnel maintaining employee medical records may delete from requested medical records the identity of a family member, personal friend, or fellow employee who has provided confidential information concerning an employee's health status.)</p> <p>Verify that, upon request, the employer ensures the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.</p> <p>Verify that, whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier or by information which could reasonably be used under the circumstances indirectly to identify specific employees, the employer ensures that personal identifiers are removed before access is provided.</p> <p>(NOTE: The following are examples of direct identifiers:</p> <ul style="list-style-type: none"> <li>- name</li> <li>- address</li> <li>- social security number</li> <li>- payroll number.)</li> </ul> <p>(NOTE: The following are examples of information which could reasonably be used under the circumstances indirectly to identify specific employees:</p> <ul style="list-style-type: none"> <li>- exact age</li> <li>- height</li> <li>- weight</li> <li>- race</li> <li>- sex</li> <li>- date of initial employment</li> <li>- job title.)</li> </ul> <p>(NOTE: If the employer can demonstrate that removal of personal identifiers from an analysis is not feasible, access to the personally identifiable portions of the analysis need not be provided.)</p>

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<p><b>ACCESS TO RECORDS</b></p> <p><b>RK.40</b> <b>OSHA Access</b></p> <p><b>RK.40.1.</b> Employers must, upon request, provide access to employee exposure and medical records to representatives of the Assistant Secretary of Labor for Occupational Safety and Health (29 CFR 1910.1020(e)(3)(i)).</p> <p><b>RK.40.2.</b> Employers must prominently post a copy of any written access order from OSHA and its accompanying cover letter for at 15 working days under certain circumstances (29 CFR 1910.1020(e)(3)(ii)).</p>	<p>Verify that, upon request, the employer ensures the prompt access of representatives of the Assistant Secretary of Labor for Occupational Safety and Health to employee exposure and medical records and to analyses using exposure or medical records.</p> <p>(NOTE: Access is provided without derogation of any rights under the Constitution or the Occupational Safety and Health Act of 1970, 29 USC. 651 et seq., that the employer chooses to exercise.)</p> <p>(NOTE: Information on rules of agency practice and procedure governing OSHA access to employee medical records are contained in 29 CFR 1913.10.)</p> <p>Verify that, whenever OSHA seeks access to personally identifiable employee medical information by presenting to the employer a written access order pursuant to 29 CFR 1913.10(d), the employer prominently posts a copy of the written access order and its accompanying cover letter for at least 15 working days.</p>



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<p><b>RK.50</b>  <b>EMPLOYEE INFORMATION</b></p> <p><b>RK.50.1.</b> The employer must provide current employees with specific information upon first entering into employment and at least annually thereafter (29 CFR 1910.1020(g)(1)).</p> <p><b>RK.50.2.</b> Each employer must keep a copy 29 CFR 1910.1020 and its appendices, and make copies readily available, upon request, to employees (29 CFR 1910.1020(g)(2)).</p>	<p>Verify that, upon an employee's first entering into employment and at least annually thereafter, the employer informs current employees of the following:</p> <ul style="list-style-type: none"> <li>- the existence, location, and availability of any records covered by this section</li> <li>- the person responsible for maintaining and providing access to records</li> <li>- each employee's rights of access to these records.</li> </ul> <p>Verify that the employer keeps a copy 29 CFR 1910.1020 and its appendices, and make copies readily available, upon request, to employees.</p> <p>Verify that the employer also distributes to current employees any informational materials concerning 29 CFR 1910.1020 which are made available to the employer by the Assistant Secretary of Labor for Occupational Safety and Health.</p>



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<p><b>RK.60</b>  <b>TRANSFER OF RECORDS</b></p> <p><b>RK.60.1.</b> Whenever the employer is ceasing to do business, the employer must transfer all records subject to the requirements of 29 CFR 1910.1020 to the successor employer (29 CFR 1910.1020(h)(1)).</p> <p><b>RK.60.1.</b> Whenever the employer is ceasing to do business and there is no successor employer, the employer must notify affected current employees of their rights of access to records at least 3 mo prior to the cessation of business (29 CFR 1910.1020(h)(2)).</p>	<p>(NOTE: In the event of installation closure, all required records are retired in accordance with the tables in AFI 37-138. The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center. Installations must meet additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p> <p>Verify that, whenever the employer is ceasing to do business, the employer transfers all records subject to the requirements of 29 CFR 1910.1020 to the successor employer.</p> <p>Verify that the successor employer receives and maintains these records.</p> <p>Verify that, whenever the employer is ceasing to do business and there is no successor employer, the employer notifies affected current employees of their rights of access to records at least 3 mo prior to the cessation of business.</p>



## **CHAPTER 16**

### **HAZARD COMMUNICATION**

## CHAPTER 16

### EOH: HAZARD COMMUNICATION

#### ECAMP-ANG

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#### Applicability

The requirements for hazard communication apply to any chemical that is known to be present in the workplace in such a manner that personnel may be exposed under normal conditions of use or in an emergency. However, they do not apply to the following:

- hazardous wastes
- tobacco or tobacco products
- wood or wood products
- finished articles
- food, drugs, cosmetics, or alcoholic beverages in a retail establishment that are packed for sale to consumers
- food, drugs, or cosmetics intended for personal consumption by personnel while in the workplace
- consumer products used in the workplace in the same manner as normal consumer use, if the use results in a duration and frequency of exposure that is not greater than exposures experienced by consumers
- biologicals such as vaccines, serums, and blood products.

#### Compliance Definitions

- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1200(c)).
- *Chemical* - any element, chemical compound, or mixture of elements and/or compounds (29 CFR 1910.1200(c)).
- *Chemical Name* - the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the CAS rules of nomenclature, or a name that will clearly identify the chemical for the purpose of conducting a hazard evaluation (29 CFR 1910.1200(c)).
- *Common Name* - any designation or identification such as code name, code number, trade name, brand name, or generic name used to identify a chemical other than by its chemical name (29 CFR 1910.1200(c)).
- *Container* - any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of hazard communication, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers (29 CFR 1910.1200(c)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1200(c)).
- *Exposed* - with respect to hazard communication, exposure and exposed are understood to mean that an individual is subjected to a hazardous chemical in the course of work through any route of entry (inhalation, ingestion, skin contact or absorption, etc.); the term is understood to include potential (e.g., accidental or possible) exposure (29 CFR 1910.1200(c)).

- *Finished Article* - a manufactured item (AFOSH STD 161-21, para 2k):
  1. that is formed to a specific shape or design during manufacture
  2. that has end use function(s) dependent in whole or in part upon its shape or design during end use
  3. that does not release, or otherwise result in exposure to, a hazardous material under normal conditions of use.
- *Foreseeable Emergency* - any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that could result in an uncontrolled release of a hazardous chemical into the workplace (29 CFR 1910.1200(c)).
- *Hazard Warning* - any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning that convey the specific physical or health hazard(s), including target organ effects, of the chemical(s) in the container(s) (29 CFR 1910.1200(c)).
- *Hazardous Chemical* - any chemical that is a physical hazard or a health hazard (29 CFR 1910.1200(c)).
- *Health Hazard* - with respect to hazard communication, a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed individuals. The term health hazard includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes (29 CFR 1910.1200(c)).
- *Immediate Use* - this term is understood to mean that the hazardous chemical will be under the control of, and used only by, the person who transfers it from a labeled container and only within the work shift in which it is transferred (29 CFR 1910.1200(c)).
- *Label* - any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals (29 CFR 1910.1200(c)).
- *Material Safety Data Sheet (MSDS)* - written or printed material concerning a hazardous chemical which is prepared in accordance with 29 CFR 1910.1200(g) (29 CFR 1910.1200(c)).
- *Nonroutine Tasks* - those tasks included within a work area's normal activities but performed infrequently; for example, cleaning a solvent tank and changing the solvent, or cleaning up spills. Temporary duties outside an individual's normal Air Force Specialty Code (AFSC) or job series are also considered nonroutine tasks (AFOSH STD 161-21, para 5g(1)).
- *Physical Hazard* - a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive (29 CFR 1910.1200(c)).
- *Pyrophoric* - a chemical that will ignite spontaneously in air at a temperature of 130 °F (54.4 °C) or below (29 CFR 1910.1200(c)).
- *Responsible Party* - someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary (29 CFR 1910.1200(c)).
- *Use* - to package, handle, react, or transfer (29 CFR 1910.1200(c)).
- *Work Area* - a room or defined space in a workplace where hazardous chemicals are produced or used, and where personnel are present (29 CFR 1910.1200(c)).

- *Workplace* - an establishment, job site, or project at one geographical location containing one or more work areas (29 CFR 1910.1200(c)).



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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Hazard Communication		
Laboratories	HC.10.1 through HC.10.3	16-7
Unopened, Sealed Containers	HC.20.1 through HC.20.3	16-9
Written Hazard Communication Program	HC.30.1 through HC.30.4	16-11
Labeling	HC.40.1 through HC.40.4	16-13
Material Safety Data Sheets (MSDSs)	HC.50.1 through HC.50.4	16-15
Information and Training	HC.60.1 through HC.60.5	16-19
Hazardous Chemical Inventory	HC.70.1	16-21
Nonroutine Tasks Involving Hazardous Materials	HC.80.1 through HC.80.3	16-23
Contractor Interface	HC.90.1 and HC.90.2	16-25



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<p><b>HAZARD COMMUNICATION</b></p> <p><b>HC.10 Laboratories</b></p> <p><b>HC.10.1.</b> Installations must ensure that labels on incoming containers of hazardous chemicals are not removed or defaced (29 CFR 1910.1200(a)(3) (i)).</p> <p><b>HC.10.2.</b> Installations must maintain any MSDSs that are received with incoming shipments of hazardous chemicals (29 CFR 1910.1200(a)(3) (ii)).</p> <p><b>HC.10.3.</b> Laboratory personnel must be provided with information and training (29 CFR 1910.1200(a)(3)(iii)).</p>	<p>(NOTE: The requirements for hazard communication apply to laboratories only to the extent indicated in the following three checklist items.)</p> <p>Verify that labels on incoming containers of hazardous chemicals are not removed or defaced.</p> <p>Verify that the installation maintains any MSDSs that are received with incoming shipments of hazardous chemicals.</p> <p>Verify that the MSDSs are readily accessible during each workshift to laboratory personnel when they are in their work areas.</p> <p>Verify that laboratory personnel are provided with information and training in accordance with the requirements of 29 CFR 1910.1200(h) (see checklist items HC.60.1, HC.60.2, and HC.60.4).</p> <p>(NOTE: The location and availability of a written hazard communication program need not be addressed in the required information and training.)</p>



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<p><b>HAZARD COMMUNICATION</b></p> <p><b>HC.20</b> <b>Unopened, Sealed Containers</b></p> <p><b>HC.20.1.</b> Installations must ensure that labels on incoming containers of hazardous chemicals are not removed or defaced (29 CFR 1910.1200(a)(4) (i)).</p> <p><b>HC.20.2.</b> Installations must meet specific requirements with regard to MSDSs in the context of work operations involving unopened, sealed containers of chemicals (29 CFR 1910.1200(a)(4)(ii)).</p> <p><b>HC.20.3.</b> Personnel who handle chemicals in unopened, sealed containers must be provided with certain information and training (29 CFR 1910.1200(a)(4)(iii)).</p>	<p>NOTE: The requirements for hazard communication apply to work operations where personnel merely handle chemicals in sealed containers that are not opened under normal conditions of use only to the extent indicated in the following three questions.)</p> <p>(NOTE: Examples of such work operations are warehousing and retail sales.)</p> <p>Verify that labels on incoming containers of hazardous chemicals are not removed or defaced.</p> <p>Verify that the installation maintains copies of any MSDSs that are received with incoming shipments of the sealed containers of hazardous chemicals.</p> <p>Verify that the installation obtains an MSDS for sealed containers of hazardous chemicals received without an MSDS if personnel request the MSDS.</p> <p>Verify that the installation ensures that the MSDSs are readily accessible during each work shift to personnel when they are in their work area(s).</p> <p>Verify that such personnel are provided with information and training in accordance with the requirements of 29 CFR 1910.1200(h) (see checklist items HC.60.1, HC.60.2, and HC.60.4), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.</p> <p>(NOTE: The location and availability of a written hazard communication program need not be addressed in the required information and training.)</p>



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<p><b>HC.30</b>  <b>WRITTEN HAZARD COMMUNICATION PROGRAM</b></p> <p><b>HC.30.1.</b> Installations must develop, implement, and maintain at each workplace, a written hazard communication program (29 CFR 1910.1200(e)(1)).</p> <p><b>HC.30.2.</b> A copy of the workplace written program must be maintained in each work area (AFOSH STD 161-21, para 5a).</p> <p><b>HC.30.3.</b> The written hazard communication program must meet specific requirements as to its contents (29 CFR 1910.1200(e)(1) and AFOSH STD 161-21, para 5a(1) and 5a(2)).</p>	<p>Verify that the installation has developed and implemented a written hazard communication program.</p> <p>Verify that the installation maintains a copy of the written program at each workplace.</p> <p>Verify that a copy of the written hazard communication program is maintained in each work area.</p> <p>Verify that the written hazard communication program is accompanied by a copy of the following:</p> <ul style="list-style-type: none"> <li>- AFOSH STD 161-21, Hazard Communication</li> <li>- the hazard chemical inventory</li> <li>- a list of nonroutine operations performed in the work area.</li> </ul> <p>Verify that the written hazard communication program at the least describes how the requirements for labels and other forms of warning, MSDSs, and information and training will be met.</p> <p>Verify that the written hazard communication program also includes the following:</p> <ul style="list-style-type: none"> <li>- location and access to the MSDS master file</li> <li>- requirement for and availability of personnel information and training</li> <li>- standard operating procedures (SOPs), operating instructions (OIs), or technical orders (TOs) governing nonroutine tasks involving hazardous materials</li> <li>- a list of the hazardous chemicals known to be present, using an identity that is referenced on the appropriate MSDS</li> <li>- the methods the installation will use to inform personnel of the hazards of nonroutine tasks and the hazards associated with chemicals contained in unlabeled pipes in their work areas.</li> </ul>

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<b>HC.30.4.</b> Installations must make the written hazard communication plan available upon request (29 CFR 1910.1200(e)(4)).	Verify that the installation makes the written hazard communication plan available upon request to personnel, their designated representatives, the Assistant Secretary, and the Director.

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<p><b>HC.40 LABELING</b></p> <p><b>HC.40.1.</b> Installations must ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked with specific information (29 CFR 1910.1200(f)(5) through (f)(7), and AFOSH STD 161-21, para 5d(1)).</p> <p><b>HC.40.2.</b> Existing labels on incoming containers of hazardous chemicals must not be removed or defaced (29 CFR 1910.1200(f)(8)).</p> <p><b>HC.40.3.</b> Labels or other forms of warning must meet specific requirements (29 CFR 1910.1200(f)(9) and AFOSH STD 161-21, para 5d3).</p>	<p>Verify that each container of hazardous chemicals in the workplace is labeled, tagged, or marked with the following information:</p> <ul style="list-style-type: none"> <li>- identity of the hazardous chemical(s) contained therein</li> <li>- appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, that provide at least general information regarding the hazards of the chemicals, and that, in conjunction with the other information immediately available to personnel under the hazard communication program, will provide personnel with the specific information regarding the physical and health hazards of the hazardous chemical</li> <li>- name, address, and phone number of the manufacturer, importer, or other responsible party.</li> </ul> <p>(NOTE: The installation may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required above.)</p> <p>Verify that the written materials are readily accessible to personnel in their work area throughout each work shift.</p> <p>(NOTE: The installation is not required to label portable containers into which hazardous chemicals are transferred from labeled containers and that are intended only for the immediate use of the individual who performs the transfer. AFOSH STD 161-21, para 5d(8a) considers the labeling of immediate use containers a good practice, however.)</p> <p>Verify that existing labels on incoming containers of hazardous chemicals are not removed or defaced.</p> <p>(NOTE: This requirement does not apply if the container is immediately marked with the required information.)</p> <p>Verify that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift.</p> <p>Verify that DD Form 2521 or DD Form 2522, <i>Hazardous Chemical Warning Label</i>, is used (if available) as a uniform labeling system to meet the labeling requirements for the following:</p>

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<p><b>HC.40.4.</b> Special labeling instructions must be followed for damaged hazardous material containers placed in recovery drums (AFOSH STD 161-21, para d(6)).</p>	<ul style="list-style-type: none"> <li>- existing stocks of unlabeled materials</li> <li>- hazardous materials manufactured within the Air Force</li> <li>- transferring, repackaging, or distributing bulk quantities of hazardous materials into other containers</li> <li>- relabeling hazardous material containers when labels have been accidentally defaced or lost.</li> </ul> <p>(NOTE: Installations with personnel who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well.)</p> <p>(NOTE: New labels need not be affixed if existing labels already convey the required information.)</p> <p>Verify that, when damaged hazardous material containers are placed in recovery drums, the recovery drum is labeled using DD Form 2521 or DD Form 2522.</p> <p>Verify that, if the material is being submitted for disposal as hazardous waste, the drum is labeled and disposed of according to the provisions of the <i>Resource Conservation and Recovery Act (RCRA)</i>.</p>

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<p><b>HC.50</b>  <b>MATERIAL SAFETY DATA SHEETS (MSDSs)</b></p> <p><b>HC.50.1.</b> Installations must have an MSDS in the workplace for each hazardous chemical they use (29 CFR 1910.1200(g)(1) and (g)(8)).</p> <p><b>HC.50.2.</b> The BE will maintain the MSDS master file for the installation (AFOSH STD 161-21, para 5c(1) and 5c(2)).</p> <p><b>HC.50.3.</b> MSDSs must be in English and must contain specific information (29 CFR 1910.1200(g)(2)).</p>	<p>Verify that the installation has an MSDS for each hazardous chemical used.</p> <p>(NOTE: The DOD Hazardous Materials Information System (HMIS) may be used to obtain MSDSs and also to generate warning labels (DOD Forms 2521/2522.)</p> <p>Verify that the BE maintains the MSDS master file for the installation.</p> <p>Verify that the MSDS master file includes MSDS information for all hazardous materials used on the installation.</p> <p>Verify that the MSDS master file is either in the form of the DOD HMIS on microfiche or compact discs, or of hard copy MSDSs.</p> <p>Verify that the master file is protected from unauthorized access.</p> <p>Verify that MSDSs are in English.</p> <p>Verify that MSDSs contain at least the following information:</p> <ul style="list-style-type: none"> <li>- the identity used on the label <ul style="list-style-type: none"> <li>- if the hazardous chemical is a single substance, its chemical and common name(s)</li> <li>- if the hazardous chemical is a mixture that has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients that contribute to these known hazards, and the common name(s) of the mixture itself</li> <li>- if the hazardous chemical is a mixture that has not been tested as a whole: <ul style="list-style-type: none"> <li>- the chemical and common name(s) of all ingredients that have been determined to be health hazards and that comprise 1 percent or greater of the composition, except that chemicals identified as carcinogens must be listed if the concentrations are 0.1 percent or greater; and the chemical and common name(s) of all ingredients that have been determined to be health hazards and that comprise less than 1 percent (0.1 percent for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations that would exceed an established OSHA permissible exposure limit or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value, or could present a health hazard to personnel</li> </ul> </li> </ul> </li> </ul>

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<p><b>HC.50.4.</b> Copies of the required MSDS for each hazardous chemical must be readily accessible during each workshift to personnel when they are in their work area(s) (29 CFR 1910.1200 (g)(8)).</p>	<ul style="list-style-type: none"> <li>- the chemical and common name(s) of all ingredients that have been determined to present a physical hazard when present in the mixture</li> <li>- physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point)</li> <li>- the physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity</li> <li>- the health hazards of the hazardous chemical, including signs and symptoms of exposure and any medical conditions that are generally recognized as being aggravated by exposure to the chemical</li> <li>- the primary route(s) of entry</li> <li>- the OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the MSDS, where available whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or by OSHA</li> <li>- any generally applicable precautions for safe handling and use that are known to the chemical manufacturer, importer, or employer preparing the MSDS, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for cleanup of spills and leaks</li> <li>- any generally applicable control measures that are known to the chemical manufacturer, importer, or employer preparing the MSDS, such as appropriate engineering controls, work practices, or personal protective equipment</li> <li>- emergency and first aid procedures</li> <li>- the date of preparation of the MSDS or the last change to it</li> <li>- the name, address, and telephone number of the chemical manufacturer, importer, employer, or other responsible party preparing or distributing the MSDS who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.</li> </ul> <p>Verify that copies of the required MSDS for each hazardous chemical are readily accessible during each workshift to personnel when they are in their work area(s).</p> <p>(NOTE: Where personnel must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the MSDSs may be kept at a central location at the primary workplace facility. In this situation, personnel must be able to immediately obtain the required information in an emergency.)</p>

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(NOTE: MSDSs may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals.)



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<p><b>HC.60</b>  <b>INFORMATION AND TRAINING</b></p> <p><b>HC.60.1.</b> Installations must provide their personnel with effective information and training on hazardous chemicals in their work area (29 CFR 1910.1200(h)(1) and AFOSH STD 161-21, para 5e(1)).</p> <p><b>HC.60.2.</b> The information provided must include specific topics (29 CFR 1910.1200(h)(2) and AFOSH STD 161-21, para 5e(2)).</p> <p><b>HC.60.3.</b> Approved training programs must be used to provide training (AFOSH STD 161-21, para 5e(3)).</p> <p><b>HC.60.4.</b> The training provided to personnel must meet specific requirements as to content (29 CFR 1910.1200 (h)(3)).</p>	<p>Verify that the installation provides personnel with effective information and training on the hazardous chemicals in their work area.</p> <p>Verify that information and training are provided at the time of initial assignment, but prior to any exposure, and whenever a new physical or health hazard on which personnel have not been trained is introduced into the work area.</p> <p>(NOTE: Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals.)</p> <p>Verify that personnel are informed of the following:</p> <ul style="list-style-type: none"> <li>- the requirements of 29 CFR 1910.1200</li> <li>- how to obtain and use the appropriate MSDS</li> <li>- any operations in their work area where hazardous chemicals are present</li> <li>- the location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals and the MSDS master file</li> <li>- explanation of the labeling system.</li> </ul> <p>Verify that either of the following is used for training:</p> <ul style="list-style-type: none"> <li>- the Federal Hazard Communication Training Program (FHCTP)</li> <li>- an equivalent Headquarters U.S. Air Force (HQ USAF/SGPA)-approved program that contains elements of the FHTCP.</li> </ul> <p>Verify that supervisors supplement this training to provide information on hazards specific to the given work area.</p> <p>Verify that the training provided to personnel includes at least the following:</p> <ul style="list-style-type: none"> <li>- methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the installation, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.)</li> <li>- the physical and health hazards of the chemicals in the work area</li> <li>- the measures that personnel can take to protect themselves from these hazards, including specific procedures implemented to protect personnel from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used</li> </ul>

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<b>HC.60.5.</b> Training must be documented (AFOSH STD 161-21, para 5e(3)(b) and 5e(7)).	<p>- the details of the hazard communication program developed by the installation, including an explanation of the labeling system and the MSDS, and how personnel can obtain and use the appropriate hazard information.</p> <p>Verify that the FHCTP and all additional hazard communication training is documented on AF Form 55, the <i>Employee Safety and Health Record</i>.</p> <p>(NOTE: The information and training conducted in support of AFOSH STD 161-21 does not take the place of occupational health related training required by other Air Force directives.)</p> <p>Verify that AF Forms 55 are maintained by the supervisor in the work area.</p>

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<p><b>HC.70 HAZARDOUS CHEMICAL INVENTORY</b></p> <p><b>HC.70.1.</b> An inventory of all hazardous materials used within the work area must be developed and maintained (29 CFR 1910.1200(e)(1) (i)).</p>	<p>Verify that the supervisor and base or attending support BE jointly develop an inventory of all hazardous materials used within the work area.</p> <p>(NOTE: Work areas in which personnel merely handle materials in sealed containers that are not opened under normal conditions of use are not required to develop or maintain this inventory.)</p> <p>Verify that supervisors maintain the inventory and update it as necessary</p> <p>Verify that the base or attending BE reviews work area inventories at least annually.</p>



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<p><b>HC.80</b>  <b>NONROUTINE TASKS INVOLVING HAZARDOUS MATERIALS</b></p> <p><b>HC.80.1.</b> Work area OIs must thoroughly describe nonroutine tasks, associated hazards, and controls (AFOSH STD 161- 21, para 5g(2)).</p> <p><b>HC.80.2.</b> Personnel who temporarily perform duties outside their normal jobs must be trained prior to beginning the activity (AFOSH STD 161-21, para 5g(3)).</p> <p><b>HC.80.3.</b> Supplemental training must be documented (AFOSH STD 161-21, para 5g(3)).</p>	<p>Verify that work area OIs thoroughly describe nonroutine tasks, associated hazards, and controls.</p> <p>Verify that personnel who temporarily perform duties outside their normal jobs are trained prior to beginning the activity.</p> <p>Verify that the training includes the following:</p> <ul style="list-style-type: none"> <li>- the initial FHCTP for workers not previously trained</li> <li>- supplemental training, as necessary, on work area specific chemical hazards and associated controls.</li> </ul> <p>Verify that the supervisor of the activity forwards a letter describing the training received to the individual's formal supervisor.</p> <p>Verify that the individual's AF Form 55 is updated by the formal supervisor.</p>



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<p><b>HC.90 CONTRACTOR INTERFACE</b></p> <p><b>HC.90.1.</b> Contractors are required to train their own personnel (AFOSH STD 161-21, para 5h(1)).</p> <p><b>HC.90.2.</b> Installations must ensure that all hazardous chemicals issued to contractors through AF supply channels are properly labeled prior to being issued to contractors (AFOSH STD 161-21, para 5h(1)).</p>	<p>Verify that contractors train their own personnel according to 29 CFR 1910.1200.</p> <p>(NOTE: Contractors are not authorized to use the FHCTP for this purpose.)</p> <p>Verify that all hazardous chemicals issued to contractors through AF supply channels are properly labeled prior to being issued to contractors.</p>



## **CHAPTER 17**

### **PERSONAL PROTECTIVE EQUIPMENT**

## CHAPTER 17

### EOH: PERSONAL PROTECTIVE EQUIPMENT

#### ECAMP-ANG

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#### Applicability

Assessors review the areas of expertise covered by BE, limited to the following:

- hearing protection (ear plugs, muffs, etc.)
- respirators (as defined by AFOSH STD 48-1)
- laser eye wear (goggles, glasses, shields, etc.)
- PPE for ionizing radiation (lead gloves, aprons, etc.)
- PPE for heat stress (ice vests, vortex tubes, etc.)
- PPE for ergonomic stresses (knee pads, arm pads, etc.)
- chemical protective clothing (gloves, aprons, coveralls, face shields, goggles, etc.)

#### Compliance Definitions

- *Air-Purifying Respirator* - a respirator that removes contaminants from the ambient air (AFOSH STD 48-1, Attachment 1, Section C).
- *Emergency-Response Respirator* - respiratory protection that is reserved and maintained solely for emergency or disaster response (e.g., spill response and containment) (AFOSH STD 48-1, Attachment 1, Section C).
- *End of Service Life Indicator* - a system that warns the user of the approach of the end of adequate protection provided by the respirator. It is normally used when an air-purifying respirator is worn for protection [against] a gas or vapor with poor warning properties (AFOSH STD 48-1, Attachment 1, Section C).
- *Escape-Only Respirator* - intended only for use during emergency egress from an atmosphere that is or may become immediately dangerous to life or health (IDLH) (AFOSH STD 48-1, Attachment 1, Section C).
- *Facial Hair* - any hair on the face of an individual that interferes with a normal face-to-respirator seal. This includes beards, sideburns, mustache, goatees, stubble, or more than one day's facial hair growth (AFOSH STD 48-1, Attachment 1, Section C).
- *Fit Factor* - the ratio of the ambient concentration of an airborne substance outside the respirator to the concentration of the substance inside the respirator cavity. It is indicative of the degree to which the respirator fits the wearer (AFOSH STD 48-1, Attachment 1, Section C).
- *Medical Clearance* - the two-part process for medically certifying personnel for respirator use. It includes medical evaluation and fit-testing (AFOSH STD 48-1, Attachment 1, Section C).
- *Negative Pressure Respirator* - a respirator in which the air pressure inside the respiratory inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere (AFOSH STD 48-1, Attachment 1, Section C).
- *Occupational Exposure Limit (OEL)* - the maximum concentration of a specified substance to which an employee may be routinely exposed without personal protection. OELs are established in AFOSH STD 161-8. For a

given chemical, it is the more stringent of the limits found in the following documents, with the exception that, if another definition is presented in AFOSH STD 161-8, that definition shall be used (AFOSH STD 48-1, Attachment 1, Section C):

- a. applicable OSHA standards (29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances*, and 29 CFR 1926, *Safety and Health Regulations for Construction*)
  - b. AFOSH standards
  - c. the latest edition of *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indexes*.
- *Poor Warning Properties* - such properties exist for those substances that do not exhibit detectable and persistent odor, taste, or irritation effects at concentrations at or below the occupational exposure limit (AFOSH STD 48-1, Attachment 1, Section C).
  - *Qualitative Fit-Test* - a pass/fail fit-test that relies on the subject's sensory response to detect the challenge agent (AFOSH STD 48-1, Attachment 1, Section C).
  - *Quantitative Fit-Test* - a fit-test that uses an instrument to measure the challenge agent inside and outside the respirator (AFOSH STD 48-1, Attachment 1, Section C).
  - *Respirator Maintainer* - a person who maintains common use respirators (i.e., those used by more than one person) (AFOSH STD 48-1, Attachment 1, Section C).
  - *Supplied-Air Respirator* - an atmosphere-supplying respirator that uses air that is delivered under pressure through a hose (AFOSH STD 48-1, Attachment 1, Section C).
  - *Tight-fitting respirator* - a respirator inlet covering that is designed to form a complete seal with the face (AFOSH STD 48-1, Attachment 1, Section C).

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### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
General Requirements	PE.10.1 through PE.10.10	17-5
Eye and Face Protection	PE.20.1 through PE.20.7	17-9
Respiratory Protection		
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<p><b>PE.10 GENERAL REQUIREMENTS</b></p> <p><b>PE.10.1.</b> Installations must provide, ensure the use of, and maintain protective equipment wherever circumstances require (29 CFR 1910.132(a) and 1910.132(b)).</p> <p><b>PE.10.2.</b> All PPE used by the installation should be of safe construction and design for the work being performed (29 CFR 1910.132(c)).</p> <p><b>PE.10.3.</b> Installations must assess workplaces to determine whether hazards are present or are likely to be present that necessitate the use of PPE (29 CFR 1910.132(d)(1)).</p> <p><b>PE.10.4.</b> Installations must have a written certification of the workplace hazard assessment that meets specific requirements (29 CFR 1910.132(d)(2)).</p>	<p>Determine whether the installation has hazards from:</p> <ul style="list-style-type: none"> <li>- processes or the environment</li> <li>- chemical hazards</li> <li>- radiological hazards</li> <li>- mechanical irritants that can cause injury or impairment in the function or any part of the body through absorption, inhalation, or physical contact.</li> </ul> <p>Verify that the installation provides, uses, and maintains in a sanitary and reliable condition, protective equipment, including personal protective equipment (PPE) for eyes, face, head, and extremities; protective clothing; respiratory devices; and protective shields and barriers.</p> <p>(NOTE: Where employees provide their own PPE, the installation is responsible to assure its adequacy including proper maintenance, and sanitation of such equipment.)</p> <p>Verify that all PPE is of safe construction and design for the type of work being performed.</p> <p>(NOTE: The certification of PPE may be done at the HazMat Pharmacy if BE reviews the specific tasks and the specific equipment to be used, including the type of materials for gloves and other chemical protective equipment.)</p> <p>Verify that the installation has conducted hazard assessments of its workplaces.</p> <p>(NOTE: The requirements of 29 CFR 1910.132(d) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p> <p>Verify that the installation documents the accomplishment of a workplace hazard assessment through a written certification that identifies:</p> <ul style="list-style-type: none"> <li>- the workplace evaluated</li> <li>- the person certifying that the evaluation has been performed</li> <li>- the date(s) of the hazard assessment</li> <li>- the document as a certification of hazard assessment.</li> </ul>

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<p><b>PE.10.5.</b> Installations must take appropriate actions when hazards requiring the use of PPE are present at the work-place (29 CFR 1910.132(d)(1)).</p>	<p>(NOTE: The requirements of 29 CFR 1910.132(d) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p> <p>Verify that, if such hazards are present, the installation:</p> <ul style="list-style-type: none"> <li>- selects, and has each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment</li> <li>- communicates selection decisions to each affected employee</li> <li>- selects PPE that properly fits each affected employee.</li> </ul> <p>(NOTE: The requirements of 29 CFR 1910.132(d) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p> <p>(NOTE: Nonmandatory Appendix B to 29 CFR 1910 Subpart I contains an example of procedures that would comply with the requirement for a hazard assessment.)</p>
<p><b>PE.10.6.</b> Installations must not use defective or damaged PPE (29 CFR 1910.132(e)).</p>	<p>Verify that the installation does not use PPE that is defective or damaged.</p>
<p><b>PE.10.7.</b> Installations must provide specific training to employees who are required to use PPE (29 CFR 1910.132(f)(1)).</p>	<p>Verify that the installation provides training to individuals required to use PPE.</p> <p>Verify that the training enables the employee to know:</p> <ul style="list-style-type: none"> <li>- when PPE is necessary</li> <li>- what PPE is necessary</li> <li>- how to properly don, doff, adjust, and wear PPE</li> <li>- the limitations of the PPE</li> <li>- the proper care, maintenance, useful life, and disposal of the PPE.</li> </ul> <p>(NOTE: The requirements of 29 CFR 1910.132(f) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p>
<p><b>PE.10.8.</b> Employees who are trained to use PPE must demonstrate an understanding of the training (29 CFR 1910.132(f)(2)).</p>	<p>Verify that an employee who is trained to use PPE demonstrates an understanding of its proper use before being allowed to perform work requiring the use of PPE.</p> <p>(NOTE: The requirements of 29 CFR 1910.132(f) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p>

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<p><b>PE.10.9.</b> Installations must retrain employees required to use PPE under specific circumstances (29 CFR 1910.132(f)(3)).</p>	<p>Verify that the installation retrains employees required to use PPE, and who have previously been trained in its proper use by the installation, when:</p> <ul style="list-style-type: none"> <li>- changes in the workplace render previous training obsolete, or</li> <li>- changes in types of PPE to be used render previous training obsolete, or</li> <li>- inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill, or</li> <li>- any other circumstances when the installation has reason to believe that the employee does not have the understanding and skill required by 29 CFR 1910.132(f)(2) (see checklist item PE.10.8).</li> </ul> <p>(NOTE: The requirements of 29 CFR 1910.132(f) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p>
<p><b>PE.10.10.</b> Installations must demonstrate that affected employees have received and understood the required training (29 CFR 1910.132(f)(4)).</p>	<p>Verify that the installation certifies that each affected employee has received and understood required training through a written certification that contains:</p> <ul style="list-style-type: none"> <li>- the name of the employee trained</li> <li>- the date(s) of training</li> <li>- the subject of the certification.</li> </ul> <p>(NOTE: The requirements of 29 CFR 1910.132(f) apply only to eye and face protection, head protection, foot protection, and hand protection. They do not apply to respiratory protection or electrical protective equipment.)</p>



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<p><b>PE.20</b>  <b>EYE AND FACE PROTECTION</b></p> <p><b>PE.20.1.</b> Installation employees must use appropriate eye or face protection when exposed to certain hazards (29 CFR 1910.133(a)(1)).</p> <p><b>PE.20.2.</b> Installation employees must use eye protection that provides side protection under certain circumstances (29 CFR 1910.133(a)(2)).</p> <p><b>PE.20.3.</b> Installation employees who wear prescription lenses must wear eye protection that accommodates the pre-scription (29 CFR 1910.133(a)(3)).</p> <p><b>PE.20.4.</b> Eye and face PPE must be distinctly marked to facilitate identification of the manufacturer (29 CFR 1910.133 (a)(4)).</p> <p><b>PE.20.5.</b> Installation employees must use equipment with appropriate filter lenses (29 CFR 1910.133(a)(5)).</p> <p><b>PE.20.6.</b> Protective eye and face devices purchased after 5 July 1994 must comply with specific standards (29 CFR 1910.133(b)(1)).</p>	<p>Determine whether employees are exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.</p> <p>Verify that the installation ensures that affected employees use appropriate eye and face protection.</p> <p>Determine whether there is a hazard in the workplace from flying objects.</p> <p>Verify that the installation ensures that affected employees use eye protection that provides side protection.</p> <p>(NOTE: Detachable side protectors (e.g., clip-on or slide-on side shields) that meet the pertinent requirements of 29 CFR 1910.133 are acceptable.)</p> <p>Verify that the installation ensures that employees who are required to wear eye protection, and who also wear prescription lenses, wear eye protection that either:</p> <ul style="list-style-type: none"> <li>- incorporates the prescription in its design, or</li> <li>- can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.</li> </ul> <p>Verify that eye and face PPE are distinctly marked to facilitate identification of the manufacturer.</p> <p>Verify that the installation ensures that employees who are required to wear eye protection wear eye PPE with filter lenses that have a shade number appropriate for protection from injurious light radiation (see Appendix 17-1).</p> <p>Determine whether protective eye and face devices were purchased on or after 5 July 1994.</p> <p>Verify that protective eye and face devices either:</p> <ul style="list-style-type: none"> <li>- comply with ANSI Z87.1 - 1989, American National Standard Practice for Occupational and Educational Eye and Face Protection, or</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul>

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<b>PE.20.7.</b> Protective eye and face devices purchased before 5 July 1994 must comply with specific standards (29 CFR 1910.133 (b)(2)).	Determine whether protective eye and face devices were purchased before 5 July 1994.  Verify that protective eye and face devices either: <ul style="list-style-type: none"> <li>- comply with ANSI Z87.1 - 1968, USA Standard for Occupational and Educational Eye and Face Protection</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul>

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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.30</b>  <b>The Base Respiratory Protection Program</b></p> <p><b>PE.30.1.</b> When engineering control measures do not prevent atmospheric contamination, or while such controls are being instituted, the installation must provide respirators to protect the health of its personnel (29 CFR 1910.134(a)(1) and (a)(2)).</p> <p><b>PE.30.2.</b> Installations where respirators are used must have a respiratory protection program (29 CFR 1910.134 (a)(1) and AFOSH STD 48-1, para 2.5.1.1).</p> <p><b>PE.30.3.</b> Installations must develop and maintain a base directive on respiratory protection (AFOSH STD 48-1, para 2.5.4.3.2).</p> <p><b>PE.30.4.</b> Specific elements must be addressed in the base respiratory protection regulation and in shop operating instructions (OIs) (AFOSH STD 48-1, para 3.3, 7.6, 9.5.4, 9.5.6, and 9.7; 29 CFR 1910.134(a)(2), 1910.134(b)(1), and 1910.134(e)(1)).</p>	<p>Verify that the installation provides its personnel with respirators suitable to the intended purpose if such equipment is necessary to protect their health.</p> <p>Determine whether installation personnel use respirators.</p> <p>Verify that the installation has a respiratory protection program.</p> <p>(NOTE: The compliance of the respiratory protection program with respect to OSHA and AFOSH requirements is assessed using the remainder of this protocol.)</p> <p>Verify that the installation has developed and maintains a base regulation that implements AFOSH STD 48-1.</p> <p>(NOTE: Attachment 2 to AFOSH STD 48-1 contains an example template for such a regulation.)</p> <p>Verify that the following elements are addressed in the base respiratory protection regulation and in shop OIs:</p> <ul style="list-style-type: none"> <li>- workplace exposure monitoring and surveillance</li> <li>- selection criteria</li> <li>- training and fit-testing procedures</li> <li>- written OIs</li> <li>- use, maintenance, and care procedures</li> <li>- administrative procedures</li> <li>- guidelines for the emergency use of respirators</li> <li>- medical surveillance</li> <li>- procedures for program evaluation.</li> </ul>

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<p><b>PE.30.5.</b> Workplace OIs must meet specific requirements (AFOSH STD 48-1, para 9.3.3 and 29 CFR 1910.134(e)(1)).</p> <p><b>PE.30.6.</b> BE must review and certify the adequacy of each shop OI on an annual basis (AFOSH STD 48-1, para 9.5.3).</p> <p><b>PE.30.7.</b> Installations must prepare and follow written procedures covering the safe use of respirators in dangerous atmospheres (29 CFR 1910.134(e)(3)).</p>	<p>(NOTE: Attachment 19 to AFOSH STD 48-1 provides a sample OI.)</p> <p>Verify that the base respiratory protection regulation includes provisions for workplace surveys to occur more than once per year based on the severity of the exposures.</p> <p>Verify that the base respiratory protection regulation outlines how emergency and rescue teams are to be trained in respirator use.</p> <p>Verify that each workplace in which respiratory protection is used has an OI approved by BE.</p> <p>Verify that the OI:</p> <ul style="list-style-type: none"> <li>- is based on BE evaluations and recommendations</li> <li>- describes the situations in which respirators are required or recommended</li> <li>- addresses annual training requirements</li> <li>- includes the following: <ul style="list-style-type: none"> <li>- respirator inspection, cleaning, storage, and maintenance procedures</li> <li>- the criteria that workers use to determine when respirator filters, canisters, or cartridges must be changed</li> <li>- a copy of the lesson plan used for training</li> <li>- the required frequency of fit-testing</li> <li>- a description of the method that the supervisor uses to ensure that all personnel are fit-tested.</li> </ul> </li> </ul> <p>Verify that the installation has developed standard procedures concerning respirator use, including procedures to cover possible emergency and routine use.</p> <p>(NOTE: The above requirement as to emergency and routine use is found in 29 CFR 1910.134(e)(1) but not in AFOSH STD 48-1.)</p> <p>Verify that BE reviews and certifies the adequacy of each shop OI on an annual basis.</p> <p>Verify that the installation has prepared written procedures covering safe use of respirators in dangerous atmospheres that might be encountered either in normal operations or emergencies.</p> <p>Verify that personnel are familiar with these procedures and the available respirators.</p>

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<p><b>PE.30.8.</b> The person who administers the base respiratory protection program must meet specific responsibilities (AFOSH STD 48-1, para 2.5.4.3.2 through 2.5.4.3.11).</p>	<p>Verify that the program administrator:</p> <ul style="list-style-type: none"> <li>- maintains current copies of the following: <ul style="list-style-type: none"> <li>- 29 CFR 1910</li> <li>- 29 CFR 1926.58</li> <li>- the NIOSH Certified Equipment List</li> </ul> </li> <li>- ensures all requirements outlined in applicable OSHA standards have been identified</li> <li>- is the base level authority on the selection, use, fit-testing, limitations, and maintenance of respirators used for protection against inhalation of harmful atmospheres</li> <li>- gives guidance to shop supervisors, as necessary, in the preparation of the shop respiratory protection program OI and annual training program</li> <li>- conducts respiratory fit-testing according to the provisions in AFOSH STD 48-1</li> <li>- educates and trains workplace supervisors, workers, and those individuals appointed to oversee the use, maintenance, and care of common use or emergency escape respirators during the initial and annual respirator fit-testing protocol</li> <li>- conducts a respiratory protection program review according to the provisions in AFOSH STD 48-1</li> <li>- ensures that BE is on the NIOSH respirator user's notices mailing list</li> <li>- prepares a master respiratory protection inventory for the base.</li> </ul>
<p><b>PE.30.9.</b> Installations must evaluate their respiratory protection program annually (AFOSH STD 48-1, para 9.5 and 29 CFR 1910.134(b)(9)).</p>	<p>Verify that BE conducts an annual review of the respiratory protection program.</p> <p>Verify that the findings of the review are reported in writing to the Aeromedical Council and the Combined Occupational Safety and Health Council.</p>
<p><b>PE.30.10.</b> The annual review of the respiratory protection program must address specific topics (AFOSH STD 48-1, para 9.5).</p>	<p>Verify that the annual review addresses the following elements as a minimum:</p> <ul style="list-style-type: none"> <li>- scope <ul style="list-style-type: none"> <li>- documentation of the number of personnel in each respiratory category (i.e., half-face, full-face, air-purifying, supplied-air)</li> </ul> </li> <li>- rationale <ul style="list-style-type: none"> <li>- current air sampling data from areas where respirators are worn that supports the decision to mandate the wear of respirators</li> <li>- status of permanent corrective action, if respirators are worn as an interim control measure</li> <li>- use category (i.e., required or recommended)</li> <li>- the number of personnel in each category</li> <li>- air sampling levels</li> </ul> </li> <li>- OIs <ul style="list-style-type: none"> <li>- documentation of the status of the base level program and each workplace OI</li> </ul> </li> </ul>

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<p><b>PE.30.11.</b> The baseline report of "initial evaluation" must address specific topics as a minimum (AFOSH STD 48-1, para 9.5.6.1).</p>	<ul style="list-style-type: none"> <li>- workplace surveys</li> <li>- BE self-inspection</li> <li>- program documentation (identification and classification of every respirator worn on base, including a clear identification of the operations and hazards that drive the use of the respirators and quantification of exposure)</li> <li>- program documentation               <ul style="list-style-type: none"> <li>- baseline report</li> <li>- annual report.</li> </ul> </li> </ul> <p>Verify that the baseline report of "initial evaluation" addresses the following topics as a minimum:</p> <ul style="list-style-type: none"> <li>- description of the elements of the respiratory protection program and the actions that the workplace supervisor and employees will be required to perform under AFOSH STD 48-1 and the base regulation, such as:               <ul style="list-style-type: none"> <li>- developing shop operating instructions</li> <li>- receiving initial and annual medical examinations</li> <li>- use, maintenance, and care of respirators</li> </ul> </li> <li>- identification of the processes for which the respirators are worn</li> <li>- identification of hazardous materials that are used in the process(es)</li> <li>- description of the frequency and duration of the operations</li> <li>- identification of the type, NIOSH approval number, and manufacturer of the respirators worn, with comments on the appropriateness of the respirator</li> <li>- clear indication of whether the use of the respirator is required or recommended</li> <li>- in the event that a supplied-air respirator or self-contained breathing apparatus (SCBA) is used:               <ul style="list-style-type: none"> <li>- identification of the compressor particulars (e.g., manufacturer, serial number, and compressor type)</li> <li>- delivery pressure and breathing air class</li> <li>- hose length</li> <li>- identification of the types of alarms (e.g., CO and/or high-temperature)</li> <li>- identification of whether filters are present, and, if they are, notes as to their condition during the evaluation and preventive maintenance requirements</li> <li>- compressed breathing air use limits and the need for routine sampling</li> <li>- for air pumps, indication of where the air intake is located and comments on the probability of inadvertent contaminant uptake.</li> </ul> </li> </ul>
<p><b>PE.30.12.</b> Annual reports must address specific topics as a minimum (AFOSH STD 48-1, para 9.5.6.2).</p>	<p>Verify that annual reports include the following as a minimum:</p> <ul style="list-style-type: none"> <li>- general review of the operation that warranted the use of respiratory protection, including documentation of whether or not anything has changed and whether or not the evaluation is still valid</li> <li>- status of worker training</li> <li>- status of respirator maintenance, care, and storage</li> </ul>

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<p><b>PE.30.13.</b> A self-inspection of the BE role in the respiratory protection program is mandatory (AFOSH STD 48-1, para 9.5.5).</p>	<p>- adequacy of the respiratory protection.</p> <p>Verify that BE conducts a review of its own role in respiratory protection.</p> <p>Verify that this self-inspection program includes the following elements as a minimum:</p> <ul style="list-style-type: none"> <li>- review of selection protocol</li> <li>- adequacy of fit-testing equipment and supplies</li> <li>- adequacy of instructor knowledge training</li> <li>- respirator procurement process</li> <li>- record keeping requirements.</li> </ul> <p>Verify that the base respiratory protection regulation includes further elements in the BE self-inspection program if necessary.</p>



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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.40</b> <b>Basic Responsibilities</b></p> <p><b>PE.40.1.</b> Supervisors of workplaces where respirators are used must meet specific responsibilities (AFOSH STD 48-1, para 2.5.2).</p> <p><b>PE.40.2.</b> Individuals who wear respirators must meet specific responsibilities (AFOSH STD 48-1, para 2.5.3 and 29 CFR 1910.134(e)(5)(ii)).</p>	<p>Verify that supervisors of workplaces where respirators are used:</p> <ul style="list-style-type: none"> <li>- maintain a copy of AFOSH STD 48-1</li> <li>- develop, maintain, and support a workplace OI that meets the requirements of AFOSH STD 48-1, Chapter 9</li> <li>- provide a copy of the OI to BE for approval</li> <li>- contact BE whenever workplace operations change to ensure that appropriate evaluations are made when new chemicals are introduced, processes or procedures are changed, or engineering controls are modified or added</li> <li>- document initial and annual training on AF Form 55</li> <li>- provide and document initial and annual training to all personnel in the workplace who use filtering face piece devices that consists of the limitations in the use of these devices and the potential hazards from their improper use</li> <li>- provide for quality control of respirator breathing air (if required) according to TO 42B-1-22 and furnish sampling results to BE</li> <li>- appoint an individual to be responsible for the use, maintenance, inspection, and care of common use, emergency, or escape respirators, as appropriate</li> <li>- ensure personnel on the respiratory protection program wear the correct respirator(s) for which they have been fit-tested and trained prior to utilization</li> <li>- advise all respirator wearers that they may leave the area at any time for relief from respirator use in the event of: <ul style="list-style-type: none"> <li>- equipment malfunction</li> <li>- physical or psychological distress</li> <li>- procedural or communication failure</li> <li>- significant deterioration of operating conditions</li> <li>- any other conditions that might require such relief.</li> </ul> </li> <li>- ensure workers do not wear contact lenses with respirators.</li> </ul> <p>Verify that individuals who wear respirators:</p> <ul style="list-style-type: none"> <li>- guard against damage to the respirator</li> <li>- report to their supervisor any change in medical status that might impact their ability to wear a respirator safely</li> <li>- inspect, clean, and maintain any respirator issued to them for their individual use</li> <li>- wear only those respirators for which they have received fit-testing and</li> </ul>

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<p><b>PE.40.3.</b> Installation personnel must use respirators in accordance with instruction and training received (29 CFR 1910.134(a)(3) and AFOSH STD 48-1, para 2.5.3).</p>	<p>training, and only for the tasks specified</p> <ul style="list-style-type: none"> <li>- maintain the integrity of the NIOSH/MSHA certification by not mixing parts from different manufacturers</li> <li>- do not wear contact lenses while wearing the respirator.</li> </ul> <p>(NOTE: The only portion of this question drawn from 29 CFR 1910 is the prohibition of the wearing of contact lenses.)</p> <p>Verify that installation personnel use respirators in accordance with the instruction and training they have received.</p>

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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.50</b> <b>General</b></p> <p><b>PE.50.1.</b> Installations must develop and update a list of the workplaces in which respirators are used (AFOSH STD 48-1, para 3.2, 3.4.1, 3.5, and 9.5.6).</p> <p><b>PE.50.2.</b> BE must survey each shop at least annually where respirators are used (AFOSH STD 48-1, para 9.5.4).</p>	<p>Verify that BE identifies the location and use of all respirators on base.</p> <p>Verify the all respirators on base are categorized as either required or recommended.</p> <p>(NOTE: For the purposes of AFOSH STD 48-1, filtering face piece devices are not considered to be respirators and may be used, at employee discretion, strictly for comfort purposes.)</p> <p>Verify that the installation has developed a list of the workplaces in which respirators are used (the master respirator inventory).</p> <p>Verify that the master respirator inventory includes at least the following:</p> <ul style="list-style-type: none"> <li>- the name of the workplace</li> <li>- the workplace identifier</li> <li>- the type of respirator used</li> <li>- the category of use (i.e., required or recommended)</li> <li>- the operations or processes during which the respirator is used.</li> </ul> <p>Verify that quarterly updates are furnished to:</p> <ul style="list-style-type: none"> <li>- the physical examinations section of PH</li> <li>- the wing safety office.</li> </ul> <p>Verify that BE surveys each shop annually where respirators are used.</p> <p>Verify that the following are items included in the annual evaluation as a minimum:</p> <ul style="list-style-type: none"> <li>- adequacy of maintenance and storage practices (shared, emergency use, and individual respirators</li> <li>- adequacy of filters used for each hazard</li> <li>- adequacy of air supply and breathing air (review of air testing results as appropriate)</li> <li>- documentation of inspection of shared and emergency use respirators</li> <li>- documentation of annual respirator training.</li> </ul>

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<p><b>PE.50.3.</b> BE must conduct an evaluation of the requirement for and the adequacy of the respirators used (AFOSH STD 48-1, para 3.4.2).</p> <p><b>PE.50.4.</b> Only government-provided respirators shall be used in AF workplaces (AFOSH 48-1, para 3.1.2, 3.2.3.1, and 9.1.1).</p> <p><b>PE.50.5.</b> No respirator may be worn unless required or recommended by BE (AFOSH 48-1, para 3.1.3 and 3.2.3).</p> <p><b>PE.50.6.</b> Supervisors must monitor the use of respirators on a routine or non-routine basis (AFOSH STD 48-1, para 9.3.1).</p>	<p>(NOTE: This survey should be carried out as part of the BE industrial shop survey, and the findings may be included in the annual written evaluation of the shop according to AFOSH STD 161-17.)</p> <p>Verify that BE conducts an evaluation of the requirement for and the adequacy of the respirators used.</p> <p>(NOTE: This evaluation may be carried out as part of the baseline or annual BE workplace evaluation and may include the following:</p> <ul style="list-style-type: none"> <li>- air sampling of contaminants in the workplace</li> <li>- review of workplace respirator operating procedures (use, care, inspection, and maintenance) and OIs</li> <li>- review of the respiratory protection equipment available in the shop.)</li> </ul> <p>Verify that, as part of this evaluation, BE ensures that:</p> <ul style="list-style-type: none"> <li>- the correct type of respirator is being used</li> <li>- if air-purifying respirators are used, the correct cartridges, filters, or canisters have been selected and are on hand</li> <li>- when respirators are used for protection against chemicals with substance-specific OSHA standards, all requirements of the OSHA standard are met.</li> </ul> <p>Verify that only government-provided respirators are used in AF workplaces.</p> <p>(NOTE: No privately procured respirators may be worn by AF employees in AF workplaces.)</p> <p>(NOTE: Filtering face piece devices may be worn at the discretion of an AF employee.)</p> <p>Verify that no respirator is worn unless it is required or recommended by BE.</p> <p>(NOTE: No elective-use respirators may be worn by AF employees in AF workplaces.)</p> <p>(NOTE: Filtering face piece devices may be worn at the discretion of an AF employee.)</p> <p>Verify that the use of respirators on a routine or nonroutine basis is monitored to ensure that:</p> <ul style="list-style-type: none"> <li>- the correct respirators are used</li> <li>- the respirators are worn properly</li> <li>- the respirators are in good condition.</li> </ul>

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<p><b>PE.50.7.</b> BE must be informed of workplace changes so that periodic monitoring may be accomplished (AFOSH STD 48-1, para 9.3.2).</p> <p><b>PE.50.8.</b> Respirator recall notices and notices of defect must be handled in accordance with specific guidelines (AFOSH STD 48-1, para 9.4).</p>	<p>Verify that BE is informed of workplace changes that affect the concentration of a substance in the work area atmosphere.</p> <p>Verify that BE notifies all users of respirators that are defective or recalled.</p> <p>Verify that, if a respirator user or base supply receives such a notice, a copy of it is sent to BE as soon as possible.</p>



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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.60</b> <b>Air Quality</b></p> <p><b>PE.60.1.</b> Compressed gaseous air, compressed gaseous O<sub>2</sub>, liquid air, and liquid O<sub>2</sub> used for respiration must meet specific requirements (AFOSH STD 48-1, para 8.2.3, and 29 CFR 1910.134(d)(1)).</p> <p><b>PE.60.2.</b> Installations that use cylinders or air compressors to supply breathing air to respirators must meet specific standards (AFOSH STD 48-1, para 8.3.3. through 8.3.3.3 and 29 CFR 1910.134(d)(2), 1910.134(d)(2)(i), and 1910.134(d)(2)(ii)).</p>	<p>Verify that compressed gaseous air, compressed gaseous O<sub>2</sub>, liquid air, and liquid O<sub>2</sub> used for respiration are of high purity.</p> <p>Verify that such air is tested according to the requirements of TO 42B-1-22 and Attachment 16 to AFOSH STD 48-1.</p> <p>(NOTE: The following two requirements are found in 29 CFR 1910.134 but not in AFOSH STD 48-1.)</p> <p>Verify that O<sub>2</sub> used for respiration meets the <i>U.S. Pharmacopoeia</i> standards for medical or breathing O<sub>2</sub> and that it is not used with air line respirators.</p> <p>Verify that compressed O<sub>2</sub> used for respiration is not used in supplied-air respirators or open circuit self-contained breathing apparatuses that have previously used compressed air.</p> <p>Verify that cylinders are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (DOT) (49CFR 178).</p> <p>Verify that, if installation personnel use air compressors, the compressors are:</p> <ul style="list-style-type: none"> <li>- breathing air-type compressors</li> <li>- equipped with necessary safety and standby devices.</li> </ul> <p>(NOTE: The above two requirements are from 29 CFR 1910.134; they are not found in AFOSH STD 48-1.)</p> <p>Verify that air compressors are situated so as to avoid entry of contaminated air into the system.</p> <p>Verify that suitable in-line air purifying sorbent beds and filters are installed to further assure breathing air quality.</p> <p>Verify that air compressors are equipped with:</p> <ul style="list-style-type: none"> <li>- a receiver of sufficient capacity to allow the respirator wearer to escape from a contaminated atmosphere in the event of compressor failure</li> <li>- alarms to indicate compressor failure or overheating.</li> </ul>

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<p><b>PE.60.3.</b> Air line couplings must be incompatible with outlets for other gas systems (AFOSH STD 48-1, para 8.3.3.4 and 29 CFR 1910.134(d)(3)).</p> <p><b>PE.60.4.</b> Air line hoses must meet length requirements (AFOSH STD 48-1, para 8.3.3.5).</p> <p><b>PE.60.5.</b> Supplied air systems must undergo inspections that meet specific requirements (AFOSH STD 48-1, para 8.3.3.6).</p> <p><b>PE.60.6.</b> Installations must meet specific requirements with regard to ambient or free-air pumps used with supplied-air systems (AFOSH STD 48-1, para 8.3.4).</p>	<p>Verify that the alarms are both visible and audible to the respirator wearer.</p> <p>(NOTE: The requirement as to the visibility and audibility of the alarm is unique to AFOSH STD 48-1.)</p> <p>Verify that, if an oil-lubricated compressor is used, it has a high-temperature or CO alarm or both.</p> <p>Verify that, if only a high-temperature alarm is used, the air from the compressor is tested frequently for CO according to TO 42B-1-22 and Attachment 16 to AFOSH STD 48-1.</p> <p>Verify that the alarms are provided that are both visible and audible to the respirator wearer.</p> <p>(NOTE: The requirement as to the visibility and audibility of the alarm is unique to AFOSH STD 48-1.)</p> <p>Verify that air line couplings are not compatible with outlets for other gas systems.</p> <p>Verify that air line hoses are no longer than specified in the manufacturer's literature.</p> <p>Verify that no air line hose is longer than 300 ft in length.</p> <p>Verify that the air line, compressor, and respirator are inspected to ensure that NIOSH or MSHA certification is valid.</p> <p>Verify that this inspection includes ensuring that all three components match the air pressure and other requirements specified in the manufacturer's literature.</p> <p>(NOTE: The AFOSH STD does not specify the frequency with which these inspections are to be conducted. Presumably, the equipment is to be inspected before each use.)</p> <p>Verify that pumps are located in a position to avoid entry of contaminated air into the system.</p> <p>Verify that air line couplings are incompatible with outlets for other gas systems.</p>

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<p><b>PE.60.7.</b> Breathing gas containers must be marked according to specific standards (29 CFR 1910.134(d)(4)).</p>	<p>Verify that air line hoses are no longer than specified in the manufacturer's literature.</p> <p>Verify that no air line hose is longer than 300 ft in length.</p> <p>Verify that the air line, compressor, and respirator are inspected to ensure that NIOSH or MSHA certification is valid.</p> <p>Verify that this inspection includes ensuring that all three components match the air pressure and other requirements specified in the manufacturer's literature.</p> <p>(NOTE: The AFOSH STD does not specify the frequency with which these inspections are to be conducted. Presumably, the equipment is to be inspected before each use.)</p> <p>Verify that breathing gas containers are marked according to one of the following standards:</p> <ul style="list-style-type: none"> <li>- ANSI Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954</li> <li>- Air, Compressed for Breathing Purposes, Federal Specification BB-A-1034a, 21 June 1968</li> <li>- Breathing Apparatus, Self-Contained, Interim Federal Specification GG-B-00675b, 27 April 1965.</li> </ul>



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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.70</b> <b>Respirator Use</b></p> <p><b>PE.70.1.</b> Installations must specify the correct respirator for each job (29 CFR 1910.134(e)(1)).</p> <p><b>PE.70.2.</b> Certain factors must be taken into consideration when selecting respirators (AFOSH STD 48-1, para 4.1, 29 CFR 1910.134(b)(11) and 1910.134(c)).</p> <p><b>PE.70.3.</b> Installations must provide and ensure the use of approved respirators only (AFOSH STD 48-1, para 4.1.5).</p> <p><b>PE.70.4.</b> Installations must follow certain procedures in areas where a respirator wearer could be overcome by a toxic or O<sub>2</sub>-deficient atmosphere should</p>	<p>Verify that the installation specifies the correct respirator for each job.</p> <p>(NOTE: Typically, the respirator type is specified in the work procedures by a qualified individual who supervises the respiratory protection program.)</p> <p>Verify that the person responsible for issuing respirators is adequately instructed to issue the correct respirator for each job.</p> <p>Verify that the following factors are considered when selecting respirators:</p> <ul style="list-style-type: none"> <li>- each worker's activity and location in a hazardous area</li> <li>- the period of time that a respirator must be worn</li> <li>- the type of respirator application (i.e., for routine, nonroutine, emergency, or rescue use)</li> <li>- the location of the hazardous area with respect to a safe area that has respirable air</li> <li>- environmental conditions and the level of effort required of the respirator wearer.</li> </ul> <p>(NOTE: Further guidance on the selection and use of appropriate respirators is found in AFOSH 48-1, sections 4.2 and 4.3, and guidance on limitations is found in section 4.4.)</p> <p>Verify the only respirators approved by NIOSH or MSHA are used.</p> <p>Verify that filtering face piece devices are not used when respiratory protection is required or recommended, even if the devices have NIOSH or MSHA certification.</p> <p>Verify that respirators designed for use in nuclear, chemical, and biological contingency environments that do not carry NIOSH or MSHA approval are not used for industrial respiratory protection, including emergency escape.</p> <p>Verify that at least one additional person is present in such areas.</p> <p>Verify that communications (visual, voice, or signal line) are maintained between both or all individuals present in such areas.</p>

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<p>the respirator fail (29 CFR 1910.134(e)(3)(i)).</p> <p><b>PE.70.5.</b> Standby personnel with suitable rescue equipment must be present in areas where self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life and health (29 CFR 1910.134(e)(3)(ii)).</p> <p><b>PE.70.6.</b> Personnel using air line respirators in atmospheres immediately hazardous to life or health must follow specific procedures (29 CFR 1910.134(e)(3) (iii)).</p> <p><b>PE.70.7.</b> Respirator wearers whose vision requires the use of corrective lenses must follow specific fitting instructions (29 CFR 1910.134(e) (5)(iii)).</p>	<p>Verify that planning ensures that there is at least one person who will be unaffected by a likely incident and who has the proper rescue equipment to assist the others in the event of an emergency.</p> <p>Verify that standby personnel with suitable rescue equipment are present in areas where self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life and health.</p> <p>Verify that personnel are equipped with safety harnesses and lines for lifting or removing persons from hazardous atmospheres or have other equivalent provisions for the rescue of persons from hazardous atmospheres.</p> <p>Verify that at least one standby person with suitable self-contained breathing apparatus is stationed at the nearest fresh air base for emergency rescue.</p> <p>Verify that, if corrective spectacles or goggles are required, they do not affect the fit of a respirator wearer's facepiece.</p> <p>(NOTE: As a temporary measure, eyeglasses with short temple bars or without temple bars may be taped to the wearer's head to ensure a proper facepiece seal.)</p> <p>Verify that, when corrective lenses are worn as part of the respirator facepiece, a qualified individual fits the facepiece and lenses to provide good vision, comfort, and a gas-tight seal.</p>

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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.80</b>  <b>Medical Clearance/ Medical Evaluation</b></p> <p><b>PE.80.1.</b> Installation personnel must not be assigned to tasks requiring the use of a respirator unless those personnel meet specific health requirements (AFOSH STD 48-1, para 3.4.4 and 29 CFR 1910.134(b)(10)).</p> <p><b>PE.80.2.</b> Potential respirator wearers must not be fit-tested for a respirator unless they are medically cleared for fit-testing following a medical evaluation (AFOSH STD 5.1 and 6.2.1).</p> <p><b>PE.80.3.</b> All respirator users must receive a baseline and an annual medical evaluation (AFOSH STD 48-1, para 5.2).</p>	<p>Verify that personnel who are assigned to tasks requiring the use of a respirator are determined by a local physician to be physically capable of performing such tasks and using the equipment.</p> <p>Verify that the medical status of personnel who use respirators is reviewed periodically (e.g., annually).</p> <p>Verify that no potential respirator wearers are fit-tested for a respirator unless they are medically cleared for fit-testing following a medical evaluation.</p> <p>(NOTE: The purpose of the evaluation is to determine whether or not the individual is physically able to wear a respirator.)</p> <p>(NOTE: The recommended approach to the medical evaluation consists of a screening questionnaire. The medical evaluation for respirator fit-testing is a separate issue from medical surveillance. The medical evaluation should address existing medical conditions that would place the worker at increased health risk from the use of the respirator or interfere with the use or wearing of a respirator.)</p> <p>Verify that all respirator users must receive a baseline and an annual medical evaluation.</p> <p>Verify that all respirator users complete a screening medical questionnaire based on Attachment 18 to AFOSH STD 48-1.</p> <p>(NOTE: AFOSH STD 48-1, para 5.3 contains further guidance on the medical evaluation process.)</p>



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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.90</b> <b>Fit-Testing</b></p> <p><b>PE.90.1.</b> Different sizes of the same model or different models of respirators should be obtained to provide employees a selection of respirators and a good fit (MP).</p> <p><b>PE.90.2.</b> Personnel using respirators must receive and follow specific fitting instructions (29 CFR 1910.134(e)(5)(i)).</p> <p><b>PE.90.3.</b> Certain actions must be taken in the event that an individual's facial hair interferes with the face piece-to-face seal (AFOSH STD 48-1, para 6.4).</p> <p><b>PE.90.4.</b> A qualitative or quantitative respirator fit-test must be used to determine the ability of each individual respirator wearer to obtain a</p>	<p>Verify that different sizes of the same model or different models of respirators are obtained to provide employees a selection of respirators and a good fit.</p> <p>(NOTE: This MP is suggested by AFOSH STD 48-1, para 6.1.)</p> <p>(NOTE: Local purchase of respirators is authorized and will be used when it is necessary to obtain an acceptable face fit.)</p> <p>Verify that every respirator wearer receives fitting instructions including demonstrations and practice in how to wear, adjust, and properly fit the respirator.</p> <p>Verify that respirator wearers do not use respirators when a good face seal cannot be attained.</p> <p>(NOTE: Factors that prevent a good face seal include the following:</p> <ul style="list-style-type: none"> <li>- the growth of a beard or sideburns</li> <li>- a skull cap that projects under the facepiece</li> <li>- the temple pieces on eyeglasses</li> <li>- the absence of one or both dentures.)</li> </ul> <p>Verify that every respirator wearer checks the facepiece fit, as directed by manufacturer instructions, prior to each use.</p> <p>Verify that the installation periodically checks to see that its respirator wearers are observing the above requirements.</p> <p>Verify that individuals with facial hair that interferes with the face piece-to-face seal are not fit-tested.</p> <p>Verify that the worker's supervisor is informed that an adequate respirator fit cannot be assured unless the facial hair is removed.</p> <p>Verify that a qualitative or quantitative respirator fit-test is used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with a tight-fitting respirator.</p> <p>Verify that quantitative respirator fit-tests are used when mandated by a sub-</p>

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<p>satisfactory fit with a tight-fitting respirator (AFOSH STD 48-1, para 6.2.1 and 6.2.2).</p> <p><b>PE.90.5.</b> Qualitative respirator fit-testing must be carried out using particular methods (AFOSH STD 48-1, para 6.1.1).</p> <p><b>PE.90.6.</b> Quantitative respiratory fit-testing must be carried out using particular methods (AFOSH STD 48-1, para 6.1.2).</p> <p><b>PE.90.7.</b> A respirator fit-test must be carried out for each wearer of a tight-fitting respirator at least once every 12 mo (AFOSH STD 48-1, para 6.2.3).</p> <p><b>PE.90.8.</b> Tight-fitting positive pressure respirators must be qualitatively or quantitatively fit-tested in a negative pressure mode (AFOSH STD 48-1, para 6.2.4).</p>	<p>stance-specific standard to select specific types, makes, and models of respirators.</p> <p>(NOTE: Qualitative fit tests may be used to fit-test all other respirator wearers.)</p> <p>(NOTE: Attachment 13 to AFOSH STD 48-1 contains the OSHA requirements for quantitative fit-testing.)</p> <p>(NOTE: Respirators used only for emergency escape do not require fit-testing.)</p> <p>Verify that only the validated protocols listed in Attachment 11 to AFOSH STD 48-1 are used for qualitative fit-testing.</p> <p>(NOTE: This requirement does not apply if a different protocol is required by a substance-specific OSHA standard.)</p> <p>Verify that the protocol provided in Attachment 12 to AFOSH STD 48-1 is used for quantitative fit-testing.</p> <p>(NOTE: This requirement does not apply if a different protocol is required by a substance-specific OSHA standard.)</p> <p>(NOTE: The minimum acceptable fit factor for negative pressure respirators is given in AFOSH STD 48-1, para 6.1.2.1; the minimum acceptable fit factor for a positive pressure respirator is given at para 6.1.2.2 of the same document.)</p> <p>Verify that a respirator fit-test is carried out for each wearer of a tight-fitting respirator at least once every 12 mo.</p> <p>(NOTE: This requirement does not apply if more frequent fit-testing is required by a specific standard.)</p> <p>(NOTE: The fit testing is considered valid for the relevant period unless the worker:</p> <ul style="list-style-type: none"> <li>- experiences difficulty with positive or negative pressure checks</li> <li>- changes weight by more than 20 lb</li> <li>- receives extensive dental work, facial cosmetic surgery, scarring, or disfigurement.)</li> </ul> <p>Verify that tight-fitting positive pressure respirators are qualitatively or quantitatively fit-tested in a negative pressure mode.</p> <p>Verify that, if the face piece of a positive pressure tight-fitting respirator is modified for fit-testing:</p> <ul style="list-style-type: none"> <li>- the modification does not affect the normal fit of the device</li> <li>- no significant weight or imbalance results</li> <li>- air flow is not restricted.</li> </ul>

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<p><b>PE.90.9.</b> Records of respirator fit-tests must be kept for at least the duration of employment (AFOSH STD 48-1, para 6.2.7).</p> <p><b>PE.90.10.</b> Each time the wearer puts on the respirator, positive and negative pressure tests must be conducted to ensure a satisfactory face fit (AFOSH STD 48-1, para 6.3).</p>	<p>(NOTE: AFOSH STD 48-1, para 6.2.6 lists actions which may be taken in the event that the worker cannot obtain a satisfactory fit.)</p> <p>Verify that records of respirator fit-tests are kept for at least the duration of employment.</p> <p>Verify that copies of the test results (AF Form 2772) are distributed as follows:</p> <ul style="list-style-type: none"> <li>- one copy to the wearer's supervisor to be maintained with AF Form 55</li> <li>- one copy to BE for filing in Tab F of the appropriate case file.</li> </ul> <p>Verify that positive and negative pressure tests are conducted each time the wearer puts on the respirator.</p> <p>(NOTE: AFOSH STD 48-1, para 6.3.1 and 6.3.2 describe methods for carrying out these pressure tests.)</p>



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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.100 Maintenance and Care</b></p> <p><b>PE.100.1.</b> Installations must have a program for maintenance and care of respirators (29 CFR 1910.134(f)(1)(i) through (f)(1)(iv)).</p> <p><b>PE.100.2.</b> Installations must conduct frequent random inspections to ensure that respirators are properly selected, used, cleaned, and maintained (29 CFR 1910.134(e)(4)).</p> <p><b>PE.100.3.</b> Installations must inspect respirator equipment according to specific guidelines (AFOSH STD 48-1, para 8.3 and 29 CFR 1910.134(b)(7), 1910.134(f)(2)(i) and 1910.134(f)(2) (iv)).</p> <p><b>PE.100.4.</b> Respirator inspections must include specific checks (AFOSH STD 48-1, para 8.3.2, implementing 29 CFR</p>	<p>(NOTE: Each individual issued a respirator is responsible for its primary maintenance and care. Where respirators are used collectively or kept ready for emergencies by a shop or operating activity, the supervisor of the activity is responsible for establishing a respirator maintenance and cleaning program as specified in 29 CFR 1910.134(f)(1) through (f)(5) (see immediately below).</p> <p>Verify that the installation has a program for maintenance and care of respirators appropriate to the type of plant, working conditions, and hazards present.</p> <p>Verify that the program includes the following basic services:</p> <ul style="list-style-type: none"> <li>- inspection for defects (including a leak check)</li> <li>- cleaning and disinfecting</li> <li>- repair</li> <li>- storage.</li> </ul> <p>Verify that a qualified individual conducts frequent random inspections of respirators to ensure they are properly selected, used, cleaned, and maintained.</p> <p>Verify that the user inspects the respirator immediately before and after each use.</p> <p>Verify that, after cleaning and sanitizing, each respirator is inspected to determine whether it is in proper working condition, needs replacement of parts, needs repairs, or should be discarded.</p> <p>(NOTE: The above requirement is in the AFOSH STD but not in 29 CFR 1910.134.)</p> <p>Verify that each respirator stored for emergency use is inspected after each use and at least monthly.</p> <p>Verify that the record of inspection of emergency or rescue respirators is maintained on AF Form 1071.</p> <p>Verify that all respirator inspections include checks for the following:</p> <ul style="list-style-type: none"> <li>- the tightness of connections</li> <li>- the condition of the following: <ul style="list-style-type: none"> <li>- respiratory inlet covering</li> <li>- head harness</li> </ul> </li> </ul>

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<p>1910.134(f)(2)(iii)).</p> <p><b>PE.100.5.</b> Respirators that do not meet applicable inspection criteria must be removed from service and repaired or replaced (AFOSH STD 48-1, para 8.3.1 and 29 CFR 1910.134(b)(7)).</p> <p><b>PE.100.6.</b> Respirators must be repaired or replaced in accordance with specific guidelines (AFOSH STD 48-1, para 8.4.1 and 29 CFR 1910.134(f)(4)).</p> <p><b>PE.100.7.</b> The cartridges, filters, or canisters of air-purifying respirators must be changed or the respirator replaced in accordance with specific guidelines (AFOSH</p>	<ul style="list-style-type: none"> <li>- valves</li> <li>- connecting tubes</li> <li>- harness assemblies</li> <li>- hoses</li> <li>- filter cartridges</li> <li>- canisters</li> <li>- service life indicator</li> <li>- electrical components</li> <li>- shelf life dates</li> </ul> <p>- the proper functioning of regulators, alarms, and other warning systems</p> <p>- the pliability of each rubber or other elastomeric part and any signs of deterioration in them.</p> <p>Verify that respirators that do not meet applicable inspection criteria are removed from service and repaired or replaced.</p> <p>Verify that only personnel trained in proper respirator maintenance and assembly perform replacement or repairs.</p> <p>Verify that replacement parts are used only as designated for specific respirators.</p> <p>(NOTE: The intent of this provision is to ensure that only parts designed for a specific respirator are used with that respirator.)</p> <p>Verify that reducing or admission valves, regulators, and alarms are adjusted or repaired by the respirator manufacturer or by a technician trained by the manufacturer.</p> <p>Verify that instrumentation for valve, regulator, and alarm adjustments and tests are calibrated to a standard traceable to the National Bureau of Standards.</p> <p>Verify that the calibration is done at intervals not to exceed 3 yr.</p> <p>(NOTE: The above requirements with respect to the adjustment and repair of alarms are not part of 29 CFR 1910.134.)</p> <p>Verify that the cartridges, filters, or canisters on air-purifying respirators are changed:</p> <ul style="list-style-type: none"> <li>- whenever the worker detects an increase in breathing resistance</li> <li>- whenever the worker smells or tastes the contaminant or detects its irritant properties</li> </ul>

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<p>STD 48-1, para 8.4.2).</p> <p><b>PE.100.8.</b> Used respirator cartridges, canisters, and/or filters must be disposed of in accordance with applicable federal, state, and local environmental regulations (AFOSH STD 48-1, para 9.6).</p> <p><b>PE.100.9.</b> Respirators issued to an individual must be cleaned and disinfected in accordance with specific guidelines (AFOSH STD 48-1, para 8.2.1, implementing 29 CFR 1910.134(f)(3)).</p> <p><b>PE.100.10.</b> Installations must store respirators according to specific guidelines (AFOSH STD 48-1, para 8.2.1, implementing 29 CFR 1910.134(f)(5)(i) through (f)(5)(iii)).</p>	<ul style="list-style-type: none"> <li>- whenever the end of service life indicator is triggered</li> <li>- as required by substance-specific OSHA standards, or</li> <li>- as directed by BE.</li> </ul> <p>Verify that, if the cartridges or filters on an air-purifying respirator are not replaceable, the respirator is replaced when one of the above conditions is met.</p> <p>Verify that used respirator cartridges, canisters, and/or filters are disposed of in accordance with applicable federal, state, and local environmental regulations.</p> <p>(NOTE: The state or local regulatory authority should be consulted for disposal guidelines.)</p> <p>(NOTE: The language used in this paragraph of AFOSH STD 48-1 is misleading. As a general principle, any used respirator cartridges, canisters, and/or filters that contain hazardous substances must be disposed of as hazardous waste, and hazardous waste streams must not be mixed. Paint booth filters are sometimes considered hazardous waste; if this is the case, cartridges, canisters, and/or filters from respirators <b>that have been used in the paint booth</b> may be disposed of with the paint booth filters. The AFOSH STD must <b>NOT</b> be interpreted to mean that used respirator cartridges, canisters, and/or filters from sources other than the paint booth itself may be disposed of with the paint booth filters.)</p> <p>Verify that respirators issued to individuals are cleaned and sanitized at the end of each day in which the respirator is used.</p> <p>Verify that each respirator is cleaned and sanitized before being worn by a different individual.</p> <p>Verify that emergency use respirators are cleaned and sanitized after being used.</p> <p>(NOTE: Attachment 15 to AFOSH STD 48-1 provides a suggested procedure for cleaning and sanitizing respirators.)</p> <p>Verify that respirators are stored in a manner that protects them against chemical agents and physical agents such as vibration, shock, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals.</p> <p>Verify that respirators are stored to prevent distortion of rubber or other elastomeric parts.</p> <p>Verify that respirators placed at stations and work areas for emergency use are quickly accessible at all times and are stored in clearly marked compartments built for the purpose.</p>

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<p><b>PE.100.11.</b> SCBA must be inspected monthly (29 CFR 1910.134(f)(2)(ii)).</p> <p><b>PE.100.12.</b> Each air and O<sub>2</sub> cylinder must be inspected in accordance with specific guidelines (AFOSH STD 48-1 and 29 CFR 1910.134(f)(2)(ii)).</p> <p><b>PE.100.13.</b> Installations must maintain AF Form 1071 for certain devices (AFOSH STD 48-1, para 8.3.2).</p>	<p>(NOTE: AFOSH STD 48-1 does not include the requirement of 29 CFR 1910.134(f)(5)(i) that emergency use respirators be stored in compartments built for that purpose.)</p> <p>(NOTE: Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatuses, are contained in use and care instructions usually mounted inside the carrying case lid.)</p> <p>Verify that the installation does not store respirators in such places as lockers or tool boxes, unless they are protected from contamination, distortion, and damage.</p> <p>Verify that SCBA is inspected monthly.</p> <p>Verify that each air and O<sub>2</sub> cylinder is inspected to ensure that it is fully charged, according to manufacturer instructions.</p> <p>Verify that the regulator and warning devices are inspected to see that they function properly.</p> <p>(NOTE: AFOSH STD 48-1 does not include the requirement to inspect the regulator and warning devices; 29 CFR 1910.134 (f)(2)(ii) is the source of that requirement.)</p> <p>Verify that the installation maintains AF Form 1071 for each SCBA, air-line respirator, and other respirators stated in the base regulation required by AFOSH 48-1.</p>

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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.110</b> <b>Gas Mask Canisters</b></p> <p><b>PE.110.1.</b> Installations must use properly worded labels as the primary means of identifying gas mask canisters (29 CFR 1910.134(g)(1), (g)(3)(i), and (g)(3)(ii)).</p> <p><b>PE.110.2.</b> Installations must label gas mask canisters with warnings concerning gas mask use (29 CFR 1910.134(g)(5)).</p> <p><b>PE.110.3.</b> Installations must use color codes as the secondary means of identifying gas mask canisters (29 CFR 1910.134(g)(1) and (g)(6)).</p> <p><b>PE.110.4.</b> Installations must label gas mask canisters that have high-efficiency filters according to specific requirements (29 CFR 1910.134(g)(4)).</p>	<p>Verify that each gas mask canister label is marked with one of the following phrases:</p> <ul style="list-style-type: none"> <li>- CANISTER FOR _____ (Name of atmospheric contaminant)</li> <li>- TYPE __ GAS MASK CONTAINER</li> </ul> <p>Verify that each gas mask canister has the following wording beneath the appropriate phrase on the label:</p> <ul style="list-style-type: none"> <li>- FOR RESPIRATORY PROTECTION IN ATMOSPHERES CONTAINING NOT MORE THAN _____ PERCENT BY VOLUME OF _____ (Name of atmospheric contaminant)</li> </ul> <p>Verify that each gas mask canister has a label warning that gas masks should be used only in atmospheres containing sufficient O<sub>2</sub> to support life (at least 16 percent by volume).</p> <p>Verify that each gas mask canister is painted a distinct color or combination of colors, as outlined in Appendix 17-2, and that the colors are clearly identifiable and distinguishable from one another.</p> <p>Verify that the color coding offers a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of ordinary atmospheres to which the canisters might be exposed under normal conditions of storage and use.</p> <p>(NOTE: Appropriately colored pressure-sensitive tape may be used for the stripes (see Appendix 17-2).)</p> <p>Verify that gas mask canisters having a high-efficiency filter for protection against radionuclides, and other highly toxic particulates are labeled with a statement of the type and degree of protection afforded by the filter.</p> <p>Verify that the degree of protection is marked as the percent of penetration of the canister by a 0.3 <math>\mu</math>-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 L/min [22.45 gal/min].</p>

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<p><b>PE.110.5.</b> Installations must ensure that the gas mask canisters it purchases or uses meet proper labeling requirements (29 CFR 1910.134(g)(2)).</p>	<p>Verify that the label is affixed to the neck end of the canister or to the gray stripe around or near the top of the canister.</p> <p>Verify that the installation purchases only those gas mask canisters that are labeled and color coded according to the standards of 29 CFR 1910.134(g) before being placed in service (see the checklist items in PE.110).</p> <p>Verify that the installation maintains the labels and color coding of its gas mask canisters at all times until the canisters have completely served their purpose.</p>

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<p><b>RESPIRATORY PROTECTION</b></p> <p><b>PE.120 Training</b></p> <p><b>PE.120.1.</b> BE must provide or arrange to provide the initial training of supervisors who have the responsibility of overseeing work activities of one or more persons who must wear respirators (AFOSH STD 48-1, para 7.1).</p> <p><b>PE.120.2.</b> The training provided to supervisors who have the responsibility of overseeing work activities of one or more persons who must wear respirators must address specific subjects (AFOSH STD 48-1, para 7.1).</p> <p><b>PE.120.3.</b> Personnel who use respirators must be instructed in their selection, use, and maintenance (29 CFR 1910.134(e)(5)).</p>	<p>Verify that BE provides or arranges to provide the initial training of supervisors who have the responsibility of overseeing work activities of one or more persons who must wear respirators.</p> <p>Verify that training is repeated when a supervisor has a permanent change of station or becomes supervisor of a different workplace.</p> <p>Verify that such training is documented on AF Form 55 and on AF Form 2767.</p> <p>Verify that the training provided to supervisors who have the responsibility of overseeing work activities of one or more persons who must wear respirators addresses the following subjects as a minimum:</p> <ul style="list-style-type: none"> <li>- basic respiratory protection practices</li> <li>- nature and extent of respiratory hazards to which workers under their supervision may be exposed</li> <li>- recognition and resolution of respirator use problems</li> <li>- principles and criteria for selecting respirators used by workers under their supervision</li> <li>- training of respirator wearers</li> <li>- fitting and issuance of respirators</li> <li>- inspection of respirators</li> <li>- use of respirators, including monitoring of use</li> <li>- maintenance and storage of respirators</li> <li>- regulations concerning respirator use, including the preparation of workplace OIs.</li> </ul> <p>Verify that the installation provides training to both supervisors and workers for the safe use, selection, and maintenance of respirators.</p> <p>Verify that the training allows personnel to:</p> <ul style="list-style-type: none"> <li>- handle the respirator</li> <li>- have the respirator fitted properly</li> <li>- test the facepiece-to-face seal</li> <li>- wear the respirator for a long period</li> <li>- wear the respirator in a test environment.</li> </ul>

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<p><b>PE.120.4.</b> Personnel who choose to wear filtering face piece devices must receive initial and update training as outlined in AFI 91-408 (AFOSH STD 48-1, para 3.5).</p> <p><b>PE.120.5.</b> Initial training that meets specific requirements must be provided to respirator wearers (AFOSH STD 48-1, para 7.3).</p>	<p>(NOTE: For the purposes of AFOSH STD 48-1, filtering face piece devices are not considered to be respirators and may be used, at employee discretion, strictly for comfort purposes.)</p> <p>Verify that personnel who choose to wear filtering face piece devices receive initial and update training as outlined in AFI 91-408.</p> <p>Verify that supervisors clearly train workers on the limitations of filtering face piece devices.</p> <p>Verify that BE provides initial training to respirator wearers.</p> <p>Verify that, if a person has a permanent change of station, initial training is repeated at an individual's new duty station.</p> <p>Verify that initial training is documented on AF Forms 55 and 2767.</p> <p>Verify that initial training includes the following elements:</p> <ul style="list-style-type: none"> <li>- instruction in the nature of the hazard (whether acute, chronic, or both) and a frank appraisal of what may happen if the respirator is not used</li> <li>- an explanation of why other controls (such as engineering controls) are not being applied or are not adequate</li> <li>- an explanation of what effort is being made to reduce or eliminate the need for respirators</li> <li>- an explanation of why a particular type of respirator has been selected for a specific respiratory hazard</li> <li>- an explanation of the operation and the capabilities and limitations of the respirator selected</li> <li>- instructions on how to recognize and cope with emergency situations</li> <li>- an explanation of how to maintain, clean, and store the respirator that includes how a worker knows when to change the filters or cartridges on an air-purifying respirator</li> <li>- instructions for special use respirators (such as IDLH, etc.)</li> <li>- instructions on how to inspect, put on, check the fit, and properly wear the respirator</li> <li>- the need to inform their supervisor of any problems experienced by themselves or their co-workers while wearing respirators</li> <li>- an opportunity for each respirator wearer to handle the respirator, learn how to don and wear it properly, check its seals, wear it in a safe atmosphere, and wear it in a test atmosphere</li> <li>- regulations concerning respirator use.</li> </ul>

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<p><b>PE.120.6.</b> Annual instruction and retraining that meets specific requirements must be provided to respirator wearers (AFOSH STD 48-1, para 7.4).</p>	<p>Verify that BE provides annual instruction and retraining to respirator wearers.</p> <p>Verify that such training includes appropriate provisions of the initial training (see above) and other provisions deemed necessary by BE as stated in the base regulation implementing AFOSH STD 48-1.</p> <p>Verify that annual instruction and retraining is documented on AF Form 55 or on an equivalent computerized program.</p>
<p><b>PE.120.7.</b> Annual training must be provided to certain base supply personnel and others who issue respirators (AFOSH STD 48-1, para 7.2).</p>	<p>Verify that base supply personnel who issue respirators receive training on procedures for issuing them.</p> <p>Verify that similar training is given to other personnel (such as bench stock monitors) who issue respirators.</p> <p>Verify that such training is conducted annually by the supervisor.</p> <p>Verify that such training is based on the procedures stated in the base regulation that implements AFOSH STD 48-1.</p> <p>Verify that such training emphasizes the importance of prohibiting the issue of "suitable substitutes" for the respirator or respirator part ordered.</p>
<p><b>PE.120.8.</b> Persons who maintain respirators must receive training that meets specific requirements (AFOSH STD 48-1, para 7.5).</p>	<p>Verify that BE trains respirator maintainers in the following areas, as a minimum:</p> <ul style="list-style-type: none"> <li>- training on the following subjects that is specific to the respirators the individual will maintain: <ul style="list-style-type: none"> <li>- inspection for defects</li> <li>- cleaning and disinfection</li> <li>- repairs</li> <li>- maintenance of respirators</li> </ul> </li> <li>- storage of respirators</li> <li>- respirator cartridge or filter change procedures, if needed</li> <li>- importance of maintaining NIOSH/MSHA certification of respirators (e.g., replacement parts).</li> </ul>
<p><b>PE.120.9.</b> Emergency teams and rescue teams must receive training in the use of respirators (AFOSH STD 48-1, para 7.6).</p>	<p>Verify that teams that are established for the purpose of responding to emergencies or rescues (such the fire department) are properly trained in the use of respirators.</p> <p>(NOTE: AFOSH STD 48-1 does not detail the how this training is to be accomplished.)</p>

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<b>PE.120.10.</b> Personnel must be trained in the use of emergency escape respirators (AFOSH STD 48-1, para 6.2.2).	Verify that personnel are trained in the use of emergency escape respirators.  (NOTE: This training requirement also applies to visitors to the workplace.)

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<p><b>PE.130</b>  <b>HAND PROTECTION</b></p> <p><b>PE.130.1.</b> Installations must select and require employees to use appropriate hand protection when exposed to certain hazards (29 CFR 1910.138 (a)).</p> <p><b>PE.130.2.</b> Installations must base the selection of the appropriate hand protection on an evaluation of the certain characteristics of the hand protection (29 CFR 1910.138 (b)).</p>	<p>Verify that the installation selects and requires employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from:</p> <ul style="list-style-type: none"> <li>- skin absorption of harmful substances</li> <li>- severe cuts or lacerations</li> <li>- severe abrasions</li> <li>- punctures</li> <li>- chemical burns</li> <li>- thermal burns</li> <li>- harmful temperature extremes.</li> </ul> <p>Verify that the installation bases the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to:</p> <ul style="list-style-type: none"> <li>- the task(s) to be performed,</li> <li>- conditions present,</li> <li>- duration of use, and</li> <li>- the hazards and potential hazards identified.</li> </ul>



## Appendix 17-1

### Filter Lenses for Protection Against Radiant Energy (29 CFR 1910.133(a)(5))

Operations	Electrode Size 1/32 in.	Arc Current	Minimum* Protective Shade
Shielded metal arc welding	less than 3	less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	more than 8	250-550	11
Gas metal arc welding and flux cored arc welding		less than 60	7
		60-160	10
		160-250	10
		250-500	10
Gas Tungsten arc welding		less than 50	8
		50-150	8
		150-500	10
Air carbon	(light)	less than 500	10
Air cutting	(heavy)	500-1000	11
Plasma arc welding		less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(light)**	less than 300	8
	(medium)**	300-400	9
	(heavy)**	400-800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

\* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

\*\* These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

Operations	Plate thickness--inches	Plate thickness--mm	Minimum Protective Shade
Gas welding:			
Light	under 1/8	under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	over 1/2	over 12.7	6
Oxygen cutting:			
Light	under 1	under 25	3
Medium	1 to 6	25 to 150	4
Heavy	over 6	over 150	5

## Appendix 17-2

### Color Coding for Gas Mask Canisters (29 CFR 1910.134, Table I-1)

Atmospheric contaminants to be protected against	Colors assigned <sup>1</sup>
Acid gases	White.
Hydrocyanic acid gas	White with 1/2-in. [1.27 cm] green stripe completely around the canister near the bottom.
Chlorine gas	White with 1/2-in. [1.27 cm] yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gases	Green with 1/2-in. [1.27 cm] white stripe completely around the canister near the bottom.
CO	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with 1/2-in. [1.27 cm] blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases	Brown.
Radioactive materials, excepting tritium and noble gases	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors	Canister color for contaminant, as designated above, with 1/2-in. [1.27 cm] gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with 1/2-in. [1.27 cm] gray stripe completely around the canister near the top.

<sup>1</sup> Gray must not be assigned as a main color for a canister designed to remove acids or vapors.

(NOTE: Orange is to be used as a complete body or stripe color to represent gases not included in this appendix. The user will need to refer to the canister label to determine the degree of protection the canister will afford.)



## **CHAPTER 18**

### **OCCUPATIONAL NOISE EXPOSURE**

## CHAPTER 18

### EOH: OCCUPATIONAL NOISE EXPOSURE

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Air Force Criterion Level* - the sound level allowed for an 8-h exposure; used as the basis for measurement of a noise standard. For the Air Force, the criterion level is 85 dB(A) (AFOSH 48-19, Attachment 1, Section C).
- *Action Level (AL)* - an 8-h, time-weighted average (TWA) of 85 dB measured on the A scale (slow response) or an equivalent dose of 50 percent (29 CFR 1910.95(c)(2)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.2(b)).
- *Audiogram* - a chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency (29 CFR 1910.95, Appendix I).
- *Audiologist* - a professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech-Language-Hearing Association or licensed by a state board of examiners (29 CFR 1910.95, Appendix I).
- *Baseline Audiogram* - the audiogram against which future audiograms are compared (29 CFR 1910.95, Appendix I).
- *Criterion Sound Level* - a sound level of 90 dB (29 CFR 1910.95, Appendix I) (compare Air Force Criterion Level).
- *Decibel (dB)* - unit of measurement of sound level (29 CFR 1910.95, Appendix I).
- *Detailed Follow-up Program* - a program of monitoring to determine if an individual's hearing loss is progressive. Workers who have permanent threshold shifts are enrolled in the program for 6 mo and receive an audiogram at 3 and 6 mo (AFOSH 161-20, para 1-2(d)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.
- *Fitness and Risk Evaluation* - evaluations performed by medical and safety professionals for the purpose of determining a worker's ability to perform specific job tasks (fitness) and the likelihood of harm, either to the worker or others, (risk) in relation to anticipated workplace exposures and job demands (AFOSH STD 161-20, para 1-2(f)).
- *H-1 Profile* - a hearing threshold criterion. An individual with an H-1 profile has less than 25 dB of loss at 500, 1000, and 2000 Hz (in either ear) and less than a total loss (both ears together) of 270 dB at 3000, 4000, and 6000 Hz (sum of six thresholds). This criterion is used to identify individuals for further evaluation to determine if they are able to capably and safely perform their job in a hazardous noise environment (AFOSH STD 161-20, para 1-2(g)).

- *Hazardous Noise* - noise having the potential to expose personnel to:
  1. an 8-h equivalent continuous A-weighted sound level greater than 85 dB or to continuous or intermittent (nonimpact) noise above 115 dB
  2. impulse or impact noise greater than 140 dB peak sound pressure level (AFOSH STD 48-19, Attachment 1, Section C; see also AFOSH STD 161-20, para 1-2(h)).
- *Hazardous Noise Area* - any area where personnel could be exposed to hazardous noise (see definition) (AFOSH 48-19, Attachment 1, Section C).
- *Hertz (Hz)* - unit of measurement of frequency, numerically equal to cycles per second (29 CFR 1910.95, Appendix I).
- *Impact Noise* - a short burst of acoustic energy consisting of either a single burst or a series of bursts. The pressure-time history of a single burst includes a rapid rise to a peak pressure followed by a somewhat slower decay of the pressure envelope to ambient pressure, both occurring within 1 s. A series of impulses may last longer than 1 s (AFOSH 48-19, Attachment 1, Section C).
- *Impulse Noise* - see Impact Noise.
- *Medical Pathology* - a disorder or disease. For purposes of this chapter, a condition or disease affecting the ear, which should be treated by a physician specialist (29 CFR 1910.95, Appendix I).
- *Noise Dose* - the ratio, expressed as a percentage, of both (29 CFR 1910.95, Appendix I):
  1. the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure
  2. the product of the criterion duration (8 h) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).
- *Noise Dosimeter* - an instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose (29 CFR 1910.95, Appendix I).
- *Noise Level* - see Sound Level.
- *Otolaryngologist* - a physician specializing in diagnosis and treatment of disorders of the ear, nose, and throat (29 CFR 1910.95, Appendix I).
- *Representative Exposure* - measurements of an individual's noise dose or 8-h TWA sound level deemed by the installation to be representative of the exposures of others in the workplace (29 CFR 1910.95, Appendix I).
- *Significant Threshold Shift (STS)* - the reference levels are subtracted from the current levels at 1000, 2000, 3000, and 4000 Hz. The differences in hearing levels calculated at 2000, 3000, and 4000 Hz are added together and divided by three, for each ear. An STS exists if the resulting average hearing loss in either ear is greater than or equal to +10 dB. Additionally, any change of +15 dB at 1000, 2000, 3000, or 4000 Hz in either ear constitutes a STS (DODI 6055.12, para F.8.f).
- *Sound Level* - 10 times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20  $\mu$ Pa. Unit: decibels. SLOW time response, in accordance with the American National Standard Institute (ANSI) S1.4-1971 (R1976), is required (29 CFR 1910.95, Appendix I).
- *Sound Level Meter* - an instrument for the measurement of sound level (29 CFR 1910.95, Appendix I).

- *Standard Threshold Shift (STS)* - a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear (29 CFR 1910.95(g)(10)(i)).
- *Threshold Shift* - a change in hearing threshold levels for the better or worse. There are varying sorts of threshold shifts (AFOSH 161-20, para 1-2(n)):
  1. detailed follow-up threshold shift (DFU-TS) - a change for the worse in hearing threshold, relative to the 40-h, noise-free audiogram, of 15 dB at 1000, 2000, 3000, or 4000 Hz, in either ear
  2. improved threshold shift - shifts in hearing thresholds for the better (negative shifts) of -20 dB, or better (more negative), at two or more frequencies (1000, 2000, 3000, or 4000 Hz), in either ear
  3. permanent threshold shift (PTS) - any standard threshold shift found on monitoring audiometry that is still present after a 40-h noise-free period
  4. STS - a change for the worse in hearing threshold, relative to the reference audiogram, of an average of 10 dB at 2000, 3000, or 4000 Hz, either ear. That is, if the sum of the shifts at 2000, 3000, or 4000 Hz in the right ear or left ear exceeds 30 dB, an STS has occurred  
(NOTE: This definition is consistent with 29 CFR 1910.95(g)(10)(i).)
  5. temporary threshold shift - a temporary loss of hearing due to exposure to high intensity noise; any STS found on monitoring audiometry that disappears after a 15-h or 40-h noise-free period.
- *TWA (time-weighted average) Sound Level* - that sound level that, if constant over an 8-h exposure, would result in the same noise dose as is measured (29 CFR 1910.95, Appendix I).



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### **GUIDANCE FOR CHECKLIST USERS**

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General	NO.10.1 through NO.10.5	18-7
Permissible Exposure Limits	NO.20.1 through NO.20.4	18-9
Hazardous Noise Areas	NO.30.1 through NO.30.4	18-11
Exposure Monitoring	NO.40.1 through NO.40.7	18-13
Hearing Conservation Program	NO.50.1 through NO.50.27	18-15
Hearing Protection	NO.60.1 through NO.60.6	18-21
Training Program	NO.70.1 through NO.70.5	18-23
Recordkeeping	NO.80.1 through NO.80.5	18-25

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Appendix 18-1, Limiting Values for Unprotected Noise Exposures 18-27

Appendix 18-2, Maximum Permissible Ultrasound Exposure Levels 18-29



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<p><b>NO.10 GENERAL</b></p> <p><b>NO.10.1.</b> BE must review facility and operations plans for new or modified facilities (AFOSH STD 48-19, para 1.6.2.1.2.).</p> <p><b>NO.10.2.</b> The health effects of noise must be evaluated as part of certain surveys (AFOSH STD 48-19, para 3.1.).</p> <p><b>NO.10.3.</b> BE must perform a noise survey or assessment of each new job before new operations start (AFOSH STD 48-19, para 1.6.2.1.3.).</p> <p><b>NO.10.4.</b> BE must perform initial siting surveys for the placement of audiometric booths (AFOSH STD 48-19, para 1.6.2.1.11.).</p> <p><b>NO.10.5.</b> BE must evaluate the effectiveness of certain controls, procedures, and devices (AFOSH STD 48-19, para 1.6.2.1.5.).</p>	<p>Verify that BE reviews facility and operations plans for new or modified facilities to ensure that noise exposure control is appropriately considered.</p> <p>Verify that the health effects of noise are evaluated as part of baseline workplace surveys, annual workplace surveys, and when operations change or new operations start.</p> <p>Verify that surveys are performed when specific requests address the potential for hazardous noise exposure, or evaluation of other types of requests show there to be potential noise hazards.</p> <p>Verify that BE performs a noise survey or assessment of each new job before new operations start.</p> <p>Verify that BE performs initial surveys for placement of audiometric booths.</p> <p>Verify that BE performs annual background noise level checks inside audiometric booths to ensure compliance with AFR 161-15.</p> <p>(NOTE: AFR 161-15 has been rescinded.)</p> <p>Verify that BE evaluates the effectiveness of engineering controls, administrative procedures, and hearing protection devices in reducing worker noise exposure.</p>



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<p><b>NO.20</b>  <b>PERMISSIBLE EXPOSURE LIMITS</b></p> <p><b>NO.20.1.</b> Installations must protect personnel against the effects of noise exposure when noise levels exceed specified limits (AFOSH STD 48-19, para 2.1.2.).</p> <p><b>NO.20.2.</b> Unprotected personnel must not be exposed to impulse or impact noise exceeding 140 dB peak sound pressure level (AFOSH STD 48-19, para 2.1.3.).</p> <p><b>NO.20.3.</b> Octave and one-third octave band levels may not exceed certain limits (AFOSH STD 48-19, para 2.2.2.).</p> <p><b>NO.20.4.</b> Special exposure limits apply to upper sonic and ultrasonic acoustic radiation (AFOSH STD 48-19, para 2.2.3.).</p>	<p>Determine whether the duration of unprotected exposure to noise per day exceeds the values specified in Appendix 18-1 for the levels indicated for continuous exposure.</p> <p>Verify that the installation utilizes administrative or engineering controls to reduce noise levels below the specified limits.</p> <p>Verify that, if such controls fail to reduce sound below the specified limits, the installation provides and ensures the use of PPE.</p> <p>Verify that no unprotected personnel are exposed to impulse or impact noise exceeding 140 dB peak sound pressure level.</p> <p>Verify that no octave or one-third octave band level exceeds 145 dB for frequencies in the range of 1 Hz through 40 Hz.</p> <p>Verify that the overall A-weighted sound pressure level is below 150 dB(A).</p> <p>(NOTE: There are not time limits for exposures below these levels, but protection of hearing requires adherence to the limits in Appendix 18-1.)</p> <p>Verify that the values in Appendix 18-2 are used as guides in the control of exposure to upper sonic and ultrasonic acoustic radiation.</p> <p>(NOTE: The levels in Appendix 18-2 apply only to spectra with significant high-frequency or ultrasound tones as typically encountered with ultrasound cleaners and such devices.)</p>



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<p><b>NO.30</b>  <b>HAZARDOUS NOISE AREAS</b></p> <p><b>NO.30.1.</b> BE must perform hazardous noise surveillance (AFOSH STD 48-19, para 1.6.2.1.1., 1.6.2.1.4., and 1.6.2.1.7.).</p> <p><b>NO.30.2.</b> BE must notify supervisors of personnel identified as being exposed to hazardous noise (AFOSH STD 48-19, para 1.6.2.1.6.).</p> <p><b>NO.30.3.</b> Hazardous noise areas must be clearly identified (AFOSH STD 48-19, para 2.1.4.).</p>	<p>Verify that BE performs hazardous noise surveillance to determine if workers who are potentially exposed to hazardous noise require engineering controls, administrative controls, or personal protection, or if potential hazardous noise areas require posting.</p> <p>Verify that BE informs the installation commander of the need for marking hazardous noise areas.</p> <p>Verify that BE provides to the Director of Safety a listing of hazardous noise areas that identifies the physical boundaries and conditions of use for which hearing protection is required.</p> <p>Verify that BE assigns a risk assessment code (RAC) when hazardous noise areas or exposures are identified and permanent engineering controls or administrative procedures are feasible.</p> <p>Verify that BE includes noise survey findings and hearing protection requirements on AF Form 2755 and forwards copy B of that form to PH.</p> <p>Verify that BE notifies supervisors of personnel identified as being exposed to hazardous noise, in writing and within 30 days after all measurements are completed and a final determination is made.</p> <p>Verify that hazardous noise areas are clearly identified by signs located at entrances to, or the borders of, the areas.</p> <p>Verify that signs are designed according to the guidelines in AFOSH STD 127-45, Attachment 1.</p> <p>Verify that signs bear the following message:</p> <p style="text-align: center;"><b>CAUTION</b>  <b>HAZARDOUS NOISE AREA</b>  <b>HEARING PROTECTION REQUIRED</b></p> <p>(NOTE: AF Visual Aid 161-2 may be used for this purpose.)</p> <p>(NOTE: Such wordings as WHEN MACHINES ARE OPERATING or WITHIN 25 ft [7.62 m] OF OPERATING BAND SAW may be added at the bottom of the</p>

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<b>NO.30.4.</b> Hearing protection must be worn in hazardous noise areas or when using noise hazardous equipment (AFOSH STD 48-19, para 2.1.4.).	<p>sign to accurately identify the noise hazard area. In such instances, the BE specifies the exact wording to be used.)</p> <p>Verify that all personnel in hazardous noise areas wear hearing protection when sources of hazardous noise are operating.</p> <p>Verify that all personnel using noise hazardous equipment wear hearing protection.</p> <p>(NOTE: These requirements apply regardless of the duration of exposure.)</p>

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<p><b>NO.40 EXPOSURE MONITORING</b></p> <p><b>NO.40.1.</b> Installations must develop and implement a monitoring program when any individual's noise exposure exceeds an equivalent dose of 8-h at 85 DBA (29 CFR 1910.95(d)(1)).</p> <p><b>NO.40.2.</b> Installations must use an appropriate sampling strategy as part of its monitoring (29 CFR 1910.95(d)(1)(i) and (d)(1)(ii)).</p> <p><b>NO.40.3.</b> Installations must follow specific procedures for taking noise measurements (29 CFR 1910.95(d)(2)).</p> <p><b>NO.40.4.</b> Installations must repeat monitoring of noise exposure under specific circumstances (29 CFR 1910.95(d)(3)).</p> <p><b>NO.40.5.</b> TWA calculations must be corrected for non-traditional 8-h work days (29 CFR 1910.95(c) and</p>	<p>Determine whether any installation personnel are exposed to noise at or above an 8-h TWA of 85 dB.</p> <p>Verify that the installation has a monitoring program to measure the noise exposure of such personnel.</p> <p>Verify that the installation uses a sampling strategy designed to:</p> <ul style="list-style-type: none"> <li>- identify personnel for inclusion in the hearing conservation program</li> <li>- enable the proper selection of hearing protectors.</li> </ul> <p>Verify that, where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the installation uses representative personal sampling.</p> <p>(NOTE: This provision does not apply if the installation can demonstrate that area sampling produces equivalent results.)</p> <p>Verify that all continuous, intermittent, and impulsive sound levels from 80 dB to 130 dB are integrated into the noise measurements.</p> <p>Verify that the instruments used to measure noise exposure are calibrated to ensure their accuracy.</p> <p>Verify that the installation repeats exposure monitoring whenever a change in production, process, equipment, or controls increases noise exposures to the extent that:</p> <ul style="list-style-type: none"> <li>- additional personnel are exposed to noise at or above the action level</li> <li>- the attenuation provided by hearing protectors is rendered inadequate to meet the requirements of 29 CFR 1910.95(j) (see checklist items NO.60.4 through NO.60.6).</li> </ul> <p>Determine whether any installation personnel are not working a traditional 8-h work day.</p>

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<p>DODI 6055.12, para F.3.h).</p> <p><b>NO.40.6.</b> Installations must notify personnel routinely exposed to noise above an equivalent dose of 8-h at 85 DBA (29 CFR 1910.95(e) and DODI 6055.12).</p> <p><b>NO.40.7.</b> Installations must provide affected personnel or their representatives with an opportunity to observe exposure monitoring (29 CFR 1910.95(f)).</p>	<p>Verify that the BE makes appropriate corrections to the 8-h TWA calculations to reflect the changes due to the non-traditional work day.</p> <p>(NOTE: For instructions regarding noise exposure computation, see AFOSH STD 48-8, 3.2.2.2.2.)</p> <p>Determine whether any installation personnel are routinely exposed to noise at or above an 8-h TWA of 85 dB.</p> <p>Verify that the installation informs such personnel of the results of exposure monitoring.</p> <p>Verify that the installation provides affected personnel or their designated representatives with an opportunity to observe any noise measurements conducted as part of exposure monitoring.</p>

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<p><b>NO.50 HEARING CONSERVATION PROGRAM</b></p> <p><b>NO.50.1.</b> Installations must administer a continuing, effective hearing conservation program when personnel noise exposure routinely exceeds certain levels (29 CFR 1910.95(c) and DODI 6055.12).</p> <p><b>NO.50.2.</b> Installations must establish and maintain an audiometric testing program for certain personnel (29 CFR 1910.95(g)(1), (g)(2), (g)(5); and AFOSH STD 48-19, para 3.2.2. 2.3.1; and DODI 6055.12, para F.7.a).</p> <p><b>NO.50.3.</b> Audiometric tests must be performed by a qualified individual (DODI 6055.12, para F.8.b.1).</p>	<p>Determine whether personnel noise exposures routinely meet or exceed an 8-h TWA of 85 dB.</p> <p>Verify that the installation administers a continuing, effective, hearing conservation program that meets all the requirements of 29 CFR 1910.95(d) through (m) (see checklist items NO.40.1 through NO.80.5).</p> <p>Verify that the installation provides an audiometric testing program at no cost to installation personnel routinely exposed to noise at or above an 8-h TWA of 85 dB.</p> <p>Verify that a baseline audiogram is established within 6 mo of an individual's first exposure at or above the action level.</p> <p>(NOTE: If the 3-day average equivalent continuous exposure level is below 82 dB(A) and all daily exposure levels are below 85 dB(A), no further monitoring is required, and personnel need not be entered into audiometric monitoring.)</p> <p>Verify that audiometric tests are performed by one of the following individuals:</p> <ul style="list-style-type: none"> <li>- a licensed or certified audiologist, otolaryngologist, or other physician</li> <li>- a technician who is responsible to an audiologist, otolaryngologist, or other physician and: <ul style="list-style-type: none"> <li>- is certified by the Council of Accreditation in Occupational Hearing Conservation, or</li> <li>- has completed equivalent military training.</li> </ul> </li> </ul> <p>(NOTE: OSHA has slightly different requirements for individuals who perform audiometric tests (see 29 CFR 1910.95(g)(3)).)</p> <p>Verify that standard instructions are given to individuals before testing.</p> <p>(NOTE: See the Audiometric Instructions Poster for such instructions.)</p>

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<p><b>NO.50.4.</b> Audiograms must meet specific requirements (29 CFR 1910.95 (g)(4)).</p>	<p>Verify that all audiograms obtained by the installation meet the requirements of 29 CFR 1910.95, Appendix C, <i>Audiometric Measuring Instruments</i>.</p>
<p><b>NO.50.5.</b> All individuals entering hazardous noise exposed jobs must obtain a preplacement exam and reference audiogram within 30 days of entering the job (AFOSH STD 161-20, para 3-4a).</p>	<p>Verify that all individuals entering hazardous noise exposed jobs obtain a preplacement exam and reference audiogram within 30 days of entering the job.</p> <p>(NOTE: It is strongly recommended that workers receive a preplacement exam before they begin working in a hazardous noise exposed job.)</p> <p>(NOTE: Any individual terminated from the monitoring program for 12 mo or more requires a preplacement exam and a new reference audiogram.)</p> <p>(NOTE: Workers already on the monitoring program with valid reference audiograms in their medical records who move from one installation to another do not require a preplacement exam.)</p>
<p><b>NO.50.6.</b> The preplacement hearing conservation examination requires completion of certain elements (AFOSH STD 161-20, para 3-4b(1) through 3-4b(3)).</p>	<p>Verify that the following are completed in the preplacement hearing conservation examination:</p> <ul style="list-style-type: none"> <li>- Audiometric Case History (AF Form 1753 - Section I)</li> <li>- Clinical Examination (AF Form 1753 - Section II)</li> <li>- Reference Audiogram (DD Form 2215).</li> </ul>
<p><b>NO.50.7.</b> All personnel must be noise-free for 14-h before receiving the reference audiogram (DODI 6055.12, para F.8.c).</p>	<p>Verify that reference audiograms are given only to personnel who have been noise-free for the previous 14-h period.</p>
<p><b>NO.50.8.</b> Personnel who exceed the H-1 profile at preplacement must undergo a fitness and risk evaluation (AFOSH STD 161-20, para 3-4(b)).</p>	<p>Verify that personnel who exceed the H-1 profile at preplacement undergo a fitness and risk evaluation before the examining practitioner makes a final medical determination.</p> <p>(NOTE: Personnel who are known to exceed the H-1 profile, have undergone a fitness and risk evaluation in the past, and have not significantly shifted from a previous reference do not require a repeat evaluation.)</p>
<p><b>NO.50.9.</b> Installations must obtain an audiogram at least annually for personnel exposed to noise at or above an equivalent dose of 8-h at 85 DBA (29 CFR 1910.95(g)(6) and AFOSH STD 161-20, para 3-5a).</p>	<p>Verify that, for personnel exposed to noise at or above an 8-h TWA of 85 dB, the installation obtains an audiogram at least annually following the baseline audiogram.</p> <p>Verify that the following are completed as part of the annual examination:</p> <ul style="list-style-type: none"> <li>- Audiometric Case History (AF Form 1753 - Section I)</li> <li>- Annual Audiogram (DD Form 2216)</li> <li>- Assessment and Disposition (AF Form 2770).</li> </ul>

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<p><b>NO.50.10.</b> Certain personnel must also receive a clinical examination (AFOSH STD 161-20, para 3-5a(3)(a)).</p> <p><b>NO.50.11.</b> Each individual's annual audiogram must be compared with his/her baseline audiogram (29 CFR 1910.95(g)(7)(i), (g)(7)(ii), and (g)(9)).</p> <p><b>NO.50.12.</b> Follow-up audiograms must be performed in certain circumstances (DODI 6055.12, para F.8.i).</p> <p><b>NO.50.13.</b> Installations must notify affected individuals in the event that an STS occurs (29 CFR 1910.95 (g)(8)(i)).</p>	<p>Verify that persons who answer 'yes' to questions 3, 4, 5, 6, or 7 on the history also receive a clinical examination.</p> <p>Verify that each individual's annual audiogram is compared to his/her baseline audiogram to determine whether the audiogram is valid and if an STS (see definition) has occurred.</p> <p>(NOTE: A technician may perform the comparison.)</p> <p>(NOTE: If the annual audiogram indicates that an individual has suffered an STS, the installation may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.)</p> <p>(NOTE: An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist, or physician evaluating the audiogram:</p> <ul style="list-style-type: none"> <li>- the STS revealed by the audiogram is persistent</li> <li>- the hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.)</li> </ul> <p>Determine whether a positive STS (decrease in hearing threshold from the reference audiogram) is noted on the periodic audiogram.</p> <p>Verify that two 14-h noise-free follow-up tests are administered to confirm that the decrease in hearing is permanent.</p> <p>(NOTE: These two follow-up tests may be performed on the same day as each other, but may not be performed on the same day as the annual audiogram.)</p> <p>(NOTE: The results of the second follow-up test may be used to create a re-established reference audiogram.)</p> <p>(NOTE: If the results of the first follow-up test do not indicate a STS, a second follow-up test is not required.)</p> <p>Determine whether the comparison of an individual's annual and baseline audiograms indicates that an STS has occurred.</p> <p>Verify that the installation notifies the affected individual of this fact, in writing, within 21 days of the determination.</p>

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<b>NO.50.14.</b> Certain personnel must receive a 14-h noise-free audiogram (NFA) (AFOSH STD 161-20, para 3-5a(3)(b)).	Verify that personnel who have an STS on an annual audiogram are given a 14-h NFA.  Verify that, if the STS is still present, a 40-h NFA is performed.
<b>NO.50.15.</b> Certain personnel must be enrolled in a Detailed Follow-Up (DFU) Program (AFOSH STD 161-20, para 3- 5a(3)(c) and 3-11a).	Verify that personnel with their first PTS (STS on a 40-h NFA) are enrolled in a DFU Program.  Verify that workers with a second PTS are referred to a Hearing Conservation Diagnostic Center before the examining practitioner makes a final medical recommendation.  (NOTE: Air Force Logistics Command (AFLC) personnel are referred to a Hearing Conservation Center.)
<b>NO.50.16.</b> Certain personnel must be referred to PH (AFOSH STD 161- 20, para 3-5a(3)(d)).	Verify that all personnel with an STS are referred to PH for reeducation and for refitting of hearing protectors.  (NOTE: This requirement applies even if the STS does not persist on a 14-h or 40-h NFA.)
<b>NO.50.17.</b> Installations must take specific actions when subsequent audiometric tests of an individual indicate that an STS is not persistent (29 CFR 1910.95(g)(9)).	Verify that the installation informs the individual of the new audiometric interpretation.  Verify that the installation discontinues the required use of hearing protectors for that individual.
<b>NO.50.18.</b> PH must inform personnel who are identified to have a PTS (AFOSH STD 161-20, para 3-5a(3)(e) and 3- 11f).	Verify that PH informs personnel with a PTS of that shift.  Verify that notification is made in writing and within 21 days.
<b>NO.50.19.</b> Installations must provide for the evaluation of problem audiograms (29 CFR 1910.95(g)(7)(iii)).	Verify that the audiologist, otolaryngologist, or physician reviews and evaluates problem audiograms.  Verify that the installation provides the reviewer with the following information:  - a copy of the hearing conservation requirements as set forth in 29 CFR 1910.95(c) through (n) - the baseline audiogram and most recent audiogram of the individual to be evaluated - measurements of background sound pressure levels in the audiometric test room as required in 29 CFR, Appendix D, <i>Audiometric Test Rooms</i>

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<p><b>NO.50.20.</b> Individuals who have suffered an STS must use hearing protectors (29 CFR 1910.95(g)(8)(ii)).</p> <p><b>NO.50.21.</b> Installations must inform personnel of the need for an otological examination if a medical pathology of the ear unrelated to the wearing of hearing protectors is suspected (29 CFR 1910.95(g)(8)(ii)(D)).</p> <p><b>NO.50.22.</b> Certain personnel must be given termination-of-exposure exams (AFOSH STD 161-20, para 3-6a).</p> <p><b>NO.50.23.</b> Certain personnel must be given 14-h and/or 40-h NFA (AFOSH STD 161-20, para 3-6b).</p>	<p>- records of audiometer calibrations.</p> <p>Verify that the installation ensures that individuals who do not use hearing protectors:</p> <ul style="list-style-type: none"> <li>- are fitted with protectors</li> <li>- are trained in their use and care</li> <li>- are required to use them.</li> </ul> <p>Verify that the installation ensures that individuals already using hearing protectors:</p> <ul style="list-style-type: none"> <li>- are refitted with protectors</li> <li>- are retrained in their use</li> <li>- are provided with hearing protectors that offer greater attenuation, if necessary.</li> </ul> <p>Verify that the installation informs an affected individual of his/her need for an otological examination if a medical pathology of the ear unrelated to the wearing of hearing protectors is suspected.</p> <p>Verify that termination examinations are given whenever personnel who are enrolled in the hearing conservation program:</p> <ul style="list-style-type: none"> <li>- leave employment</li> <li>- leave the service</li> <li>- are permanently removed from hazardous noise exposure.</li> </ul> <p>(NOTE: Permanent removal means placement in a job where hazardous noise exposure will not occur for at least 12 mo.)</p> <p>(NOTE: The termination exam is the same as the annual exam except for the assessment and disposition.)</p> <p>Verify that personnel who have an STS on a termination audiogram are given a 14-h NFA.</p> <p>Verify that personnel who have an STS on a termination audiogram and a 14-h NFA are given a 40-h NFA, are advised of the results, and given appropriate recommendations for follow-up medical care if needed.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>NO.50.24.</b> Certain personnel must be given a fitness and risk evaluation (AFOSH STD 161-20, para 3-9a).</p>	<p>Verify that the following personnel are given fitness and risk evaluations:</p> <ul style="list-style-type: none"> <li>- those who complain of being unable to correctly hear or understand routine spoken communications, auditory cues, or signals</li> <li>- those who have trouble wearing standard hearing protection devices or communications equipment</li> <li>- those who exceed the H-1 profile on preplacement</li> <li>- those who show a second PTS</li> <li>- those who show a DFU-TS</li> <li>- those who exhibit behavior resulting in invalid or unreliable audiogram results suggesting an exaggerated hearing loss, or that the problem is not related to a physical illness or disease (nonorganic)</li> </ul> <p>(NOTE: Individuals who have undergone a previous fitness and risk evaluation and whose hearing thresholds have not changed (no STS compared to previous reference) do not require a repeat evaluation, unless there are new reasons to perform one.)</p> <p>(NOTE: Flying personnel who meet the above criteria or exceed hearing standards for their particular flying class are evaluated as directed in AFR 160-43, <i>Physical Standards and Medical Examinations</i>.)</p>
<p><b>NO.50.25.</b> Personnel in the detailed follow-up (DFU) program must receive audiograms at specific intervals (AFOSH STD 161-20, para 3-11b).</p>	<p>Verify that personnel in the DFU program are given examinations at 3 mo and again at 6 mo after the new reference has been established.</p> <p>Verify that the results of the audiograms are recorded on AF Form 1671, <i>Detailed Hearing Conservation Data Follow-Up</i>.</p> <p>(NOTE: The 40-h NFA that lead to the individual's being enrolled in the DFU Program is the new reference to which this checklist item refers.)</p>
<p><b>NO.50.26.</b> Participants in the DFU Program must be referred for evaluation by an audiologist under certain circumstances (AFOSH STD 161-20, para 3-11d).</p>	<p>Verify that personnel who show a DFU-TS on either the 3- or 6-mo exam are referred for evaluation by an audiologist.</p> <p>(NOTE: Personnel will be returned to routine monitoring if, after the 6-mo DFU exam, there is no DFU-TS relative to the new reference (40-h NFA).)</p>
<p><b>NO.50.27.</b> Installations must evaluate the effectiveness of the hearing conservation program (DODI 6055.12, para F.12).</p>	<p>Verify that the hearing conservation program is evaluated annually based upon both of the following:</p> <ul style="list-style-type: none"> <li>- the prevalence of STSs during the annual audiograms and</li> <li>- the percent of identified personnel receiving annual audiograms.</li> </ul>

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<p><b>NO.60 HEARING PROTECTION</b></p> <p><b>NO.60.1.</b> Installations must make hearing protectors available to personnel whose exposure to noise is at or above an equivalent dose of 8-h at 85 DBA (29 CFR 1910.95(i)(1) and (i)(3)).</p> <p><b>NO.60.2.</b> BE must determine the type of personal hearing protection devices required and their efficacy (AFOSH STD 48-19, para 1.6.2.1.9. and AFOSH STD 161-20, para 5-1a).</p> <p><b>NO.60.3.</b> Installations must ensure that personnel who require hearing protectors use such protectors (29 CFR 1910.95(i)(2), (i)(4), (i)(5), AFOSH STD 48-19, para 2.1.2., and 161-20-5-1b).</p> <p><b>NO.60.4.</b> Installations must evaluate hearing protector attenuation for the specific noise environments in which protectors will be used (29 CFR 1910.95(j)(1)).</p>	<p>Verify that the installation provides hearing protectors at no cost to personnel whose noise exposure is at or above an 8-h TWA of 85 dB.</p> <p>Verify that the installation gives such personnel the opportunity to select their hearing protectors from a variety of suitable protectors.</p> <p>Verify that the installation replaces hearing protectors as necessary.</p> <p>Verify that BE determines the type of personal hearing protection devices required.</p> <p>Verify that BE determines whether the devices reduce noise exposure to a TWA of 85 dB(A) or less.</p> <p>Verify that the installation ensures that hearing protectors are worn by:</p> <ul style="list-style-type: none"> <li>- personnel required by AFOSH STD 48-19, para 2.1.2. to wear PPE (see checklist item NO.20.1)</li> <li>- any individual who is exposed to an 8-h TWA of 85 dB and who: <ul style="list-style-type: none"> <li>- has not yet had a baseline audiogram established pursuant to 29 CFR 1910.95(g)(5) (see checklist item NO.50.2)</li> <li>- has experienced an STS.</li> </ul> </li> </ul> <p>Verify that personal hearing protection is worn and reduction achieved until engineering controls are installed, or if they are not feasible and administrative controls (reduction in exposure time) are not effective.</p> <p>Verify that the installation trains and supervises personnel with regard to the proper use and care of the hearing protectors it provides.</p> <p>Verify that the installation ensures the proper initial fitting of hearing protectors.</p> <p>Verify that the installation evaluates hearing protector attenuation for the specific noise environments in which protectors will be used, using one of the evaluation methods outlined in 29 CFR 1910.95, Appendix B, <i>Methods for Estimating the Adequacy of Hearing Protection Attenuation</i>.</p>

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<b>NO.60.5.</b> Hearing protectors must attenuate personnel exposure to noise to specified levels (29 CFR 1910.95(j)(2), (j)(3), and AFOSH STD 48-19, para 2.1.2.).	<p>Verify that hearing protectors attenuate personnel exposure to noise at least to an 8-h TWA of 85 dB as required by AFOSH STD 48-19, para 2.1.2. (see checklist item NO.20.1).</p> <p>Verify that, for personnel who have experienced an STS, hearing protectors attenuate exposure to noise to an 8-h TWA of 85 dB or below.</p>
<b>NO.60.6.</b> Installations must re-evaluate the adequacy of hearing protector attenuation and, if necessary, provide more effective protectors (29 CFR 1910.95 (j)(4)).	<p>Verify that the installation re-evaluates the adequacy of hearing protector attenuation whenever noise exposures increase to the extent that the hearing protectors might not provide adequate attenuation.</p> <p>Verify that the installation provides more effective hearing protectors if necessary.</p>

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<p><b>NO.70</b>  <b>TRAINING PROGRAM</b></p> <p><b>NO.70.1.</b> Installations must institute and maintain a training program for personnel exposed to noise at or above the TWA action level (29 CFR 1910.95(k)(1) and (k)(2)).</p> <p><b>NO.70.2.</b> Installations must provide personnel with specific information as part of the training program (29 CFR 1910.95(k)(3); DODI 6055.12, para F.7.a; AFOSH STD 161-20, para 5-4a(1)).</p> <p><b>NO.70.3.</b> Installations must meet specific requirements with regard to the timing of training (AFOSH STD 161-20, para 5-4a(2) and 5-4a(3)).</p>	<p>Verify that the installation has a training program for personnel who are exposed to noise at or above an 8-h TWA of 85 dB.</p> <p>Verify that such personnel participate in the program.</p> <p>Verify that training is repeated annually for each individual included in the hearing conservation program.</p> <p>Verify that the training program is updated to reflect changes in protective equipment and work processes.</p> <p>Verify that the installation informs personnel of the following:</p> <ul style="list-style-type: none"> <li>- the effects of noise on hearing</li> <li>- the purpose of hearing protectors</li> <li>- advantages, disadvantages, and attenuation of various types of hearing protectors</li> <li>- mandatory requirement to wear assigned protective equipment, and administrative actions which may follow for failure to wear</li> <li>- the purpose of audiometric testing</li> <li>- an explanation of the test procedures</li> <li>- hearing loss could lead to disqualification from current duties, if hearing is critical to job performance</li> <li>- recognizing hazardous noise</li> <li>- symptoms of overexposure to hazardous noise</li> <li>- hearing protection (selection, fitting, and care)</li> <li>- hearing conservation program requirements</li> <li>- possible disciplinary actions for failure to comply with hearing protection requirements.</li> </ul> <p>Verify that initial training is completed by the PH or the base audiologist within 30 days of the preplacement examination.</p> <p>(NOTE: Ideally, this will be done when hearing protection is dispensed.)</p> <p>Verify that training is given annually by the immediate supervisor.</p> <p>(NOTE: Supervisors will be provided annual training by PH or the audiologist.)</p>

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<p><b>NO.70.4.</b> Individuals with an STS must be given additional information by PH (AFOSH STD 161-20, para 5-4a(4)).</p> <p><b>NO.70.5.</b> Installations must make information and training material available to certain parties (29 CFR 1910.95(l)).</p>	<p>Verify that PH briefs personnel with an STS at the time they have their hearing protection equipment checked and refitted.</p> <p>Verify that the installation provides a copy of 29 CFR 1910.95 to affected personnel or their designated representatives and posts a copy in the workplace.</p> <p>Verify that the installation provides affected personnel with any informational materials pertaining to 29 CFR 1910.95 that are supplied to the installation by the Assistant Secretary.</p> <p>• Verify that the installation provides all materials relating to the training program to the Assistant Secretary or Director upon request.</p>

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<p><b>NO.80</b> <b>RECORDKEEPING</b></p> <p><b>NO.80.1.</b> Installations must maintain an accurate record of all personnel exposure measurements (29 CFR 1910.95(m)(1) and DODI 6055.12, para F.11.c).</p> <p><b>NO.80.2.</b> Installations must retain all audiometric test records (29 CFR 1910.95 (m)(2) and (m)(3)(ii)).</p> <p><b>NO.80.3.</b> Training must be documented (AFOSH STD 161-20, para 5-4b).</p> <p><b>NO.80.4.</b> Installations must provide required records to certain parties upon their request (29 CFR 1910.95 (m)(4)).</p>	<p>Verify that the installation maintains an accurate record of all exposure measurements.</p> <p>Verify that the installation retains noise exposure measurement records for the duration of employment plus 40 yr.</p> <p>Verify that the installation retains records of all audiometric tests of affected personnel for the duration of their employment with the installation.</p> <p>Verify that each record includes:</p> <ul style="list-style-type: none"> <li>- name and job classification of the individual</li> <li>- the examiner's name</li> <li>- date of the last acoustic or exhaustive calibration of the audiometer</li> <li>- individual's most recent noise exposure assessment.</li> </ul> <p>Verify that the installation maintains accurate records of the measurements of back ground sound pressure levels in audiometric test rooms.</p> <p>Verify that all training conducted by PH or the base audiologist is documented on AF Form 2767 and placed in Tab F of the case file.</p> <p>Verify that all training conducted by the supervisor is documented on AF Form 55.</p> <p>(NOTE: If available, the Major Command (MAJCOM) safety staff-approved automated systems may be used to document this worker safety training.)</p> <p>Verify that the installation provides records, upon request, to any of the following:</p> <ul style="list-style-type: none"> <li>- former or current personnel</li> <li>- designated personnel representatives</li> <li>- the Assistant Secretary.</li> </ul> <p>(NOTE: The provisions of 29 CFR 1910.1020(a) through 1910.1020(e) and 1910.1020(g) through 1910.1020(i) apply to records required by this section.)</p>

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<b>NO.80.5.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.95(m)(5)).	<p>Verify that, in the event of personnel reassignment, all required records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that casefiles be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>

## Appendix 18-1

### Limiting Values for Unprotected Noise Exposures (AFOSH STD 48-19, Table 2.2)

Sound Level dB(A)	Time (minutes)
Over 115	Forbidden
115	0.5
114	0.6
113	0.7
112	0.9
111	1.2
110	1.5
109	1.9
108	2.4
107	3.0
106	3.8
105	4.7
104	6.0
103	7.5
102	9.5
101	12
100	15
99	19
98	24
97	30
96	38
95	48
94	60
93	76
92	95
91	120
90	151
89	190

Sound Level dB(A)	Time (minutes)
88	240
87	302
86	381
85	480
84	605
83**	762
82**	960
81**	1210
80**	24 h
Below 80	No limit

\* The A-weighted sound level is used to assess hearing damage risk due to exposure to noise; for engineering noise control, other measures are required. If the sum of the following fractions:  $C_1/T_1 + C_2/T_2 + \dots + C_n/T_n$  exceeds unity, then the mixed exposure should be considered to exceed the limit value. The  $C$  values are the times of exposure to a given level; the  $T$  values are the time allowed at those levels by the above appendix. All occupational noise exposures above the threshold level of 80 dB(A) shall be used in the above equation.

\*\* Exposures of more than 12 h should be followed by periods of equal length in quiet (less than 72 dB(A)).

## Appendix 18-2

### Maximum Permissible Ultrasound Exposure Levels (AFOOSH STD 48-19, Table 2.3)

One-Third Octave Band Center Frequency (kHz)	One-Third Octave Band Level (dB re $\mu$ Pa)
10	80
12.5	80
16	80
20	105
25	110
31.5	115
40	115
50	115



**CHAPTER 19**

**IONIZING RADIATION**

## CHAPTER 19

### EOH: IONIZING RADIATION

#### ECAMP-ANG

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#### Key Compliance Definitions

- *Absorbed Dose* - the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy) (10 CFR 20.1003).
- *Act* - the *Atomic Energy Act* of 1954 (42 U.S. Code (USC) 2001 et seq) as amended (10 CFR 20.1003).
- *Activity* - the rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq) (10 CFR 20.1003).
- *Adult* - an individual 18 or more years of age (10 CFR 20.1003).
- *Airborne Radioactive Material* - radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases (10 CFR 20.1003).
- *Airborne Radioactivity Area (ARA)* - a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations (10 CFR 20.1003):
  1. in excess of the derived air concentrations (DACs) specified in appendix B to 10 CFR 20
  2. to such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake or 12 DAC-hours.
- *ALARA* - (acronym for as low as is reasonably achievable) making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10 CFR 20 as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest (10 CFR 20.1003).
- *Annual Limit on Intake (ALI)* - the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 sievert (Sv)) or a committed dose equivalent to 50 rems (0.5 Sv) to any individual organ or tissue. (ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Table 1, Columns 1 and 2 of appendix B to 10 CFR 20) (10 CFR 20.1003).
- *Background Radiation* - radiation from cosmic sources: naturally occurring radioactive materials, including radon (except as it exists in the environment from the testing of nuclear explosive devices. Background radiation does not include radiation from source, by-product, or special nuclear materials regulated by the Commission (10 CFR 20.1003).
- *Bioassay* - (radiobioassay) the determination of kinds, quantities, or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (in vivo counting) or by analysis and evaluation of materials excreted or removed from the human body (10 CFR 20.1003).

- *By-Product Material (10 CFR 20.1003)* -
  1. Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident in the process of producing or utilizing special nuclear material.
  2. The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute by-product material within this definition.
- *Class (or Lung Class or Inhalation Class)* - a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: for Class D (Days) of less than 10 days, for Class W (Weeks) from 10 to 100 days, and for Class Y (Years) of greater than 100 days (10 CFR 20.1003).
- *Collective Dose* - the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation (10 CFR 20.1003).
- *Commission* - the Nuclear Regulatory Commission or its duly authorized representatives (10 CFR 20.1003).
- *Committed Dose Equivalent ( $H_{T,50}$ )* - the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-yr period following the intake (10 CFR 20.1003).
- *Committed Effective Dose Equivalent ( $H_{E,50}$ )* - the sum of the products of the weighting factors ( $w_T$ ) applicable to each of the body organs that are irradiated and the committed dose equivalent to these organs or tissues ( $H_{E,50} = \sum w_T H_{T,50}$ ) (10 CFR 20.1003).
- *Controlled Area* - an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason (10 CFR 20.1003).
- *Declared Pregnant Woman* - a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception (10 CFR 20.1003).
- *Deep-Dose Equivalent ( $H_d$ )* - the dose equivalent at a tissue depth of 1 cm ( $1000 \text{ mg/cm}^2$ ) which applies to external whole-body exposure (10 CFR 20.1003).
- *Department* - the Department of Energy established by the *Department of Energy Organization Act* (Public Law (PL) 95-91, 91 Statute 565, 42 USC 7101 et seq) to the extent that the Department, or its duly authorized representatives, exercises functions formerly vested in the U.S. Atomic Energy Commission, its Chairman, members, officers, and components and transferred to the U.S. Energy Research and Development Administration and to the Administrator thereof pursuant to sections 104 (b), (c), and (d) of the *Energy Reorganization Act* of 1974 (PL 93-438, 88 Statute 1233 at 1237, 42 USC 5814) and retransferred to the Secretary of Energy pursuant to section 301 (a) of the *Department of Energy Organization Act* (PL 95-91, 91 Statute 565 at 577-578, 42 USC 7151) (10 CFR 20.1003).
- *Derived Air Concentration (DAC)* - the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2000 h under conditions of light work (inhalation rate  $1.2 \text{ m}^3 \text{ air/h}$  [ $42.38 \text{ ft}^3 \text{ air/h}$ ]), results in an intake of one ALI (DAC values are given in Table 1, Column 3 of appendix B to 10 CFR 20) (10 CFR 20.1003).
- *Derived Air Concentration-hour (DAC-hour)* - the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. An installation may take 2000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 5 rems (0.05 Sv) (10 CFR 20.1003).

- *Dose or Radiation Dose* - a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined in other paragraphs of this section (10 CFR 20.1003).
- *Dose Equivalent ( $H_T$ )* - the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv) (10 CFR 20.1003).
- *Dosimetry Processor* - an individual or organization that processes and evaluates individual monitoring equipment in order to determine the radiation dose delivered to the equipment (10 CFR 20.1003).
- *Effective Dose Equivalent ( $H_E$ )* - the sum of the products of the dose equivalent to the organ or tissue ( $H_T$ ) and the weighting factors ( $w_T$ ) applicable to each of the body organs or tissues that are irradiated ( $H_E = \sum w_T H_T$ ) (10 CFR 20.1003).
- *Embryo/Fetus* - the developing human organism from conception until time of birth (10 CFR 20.1003).
- *Emergency-Response Respirator* - respiratory protection that is reserved and maintained solely for emergency or disaster response (e.g., spill response and containment) (AFOSH STD 48-1, Attachment 1, Section C).
- *Entrance or Access Point* - any location through which an individual could gain access to radiation areas or to radioactive materials. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use (10 CFR 20.1003).
- *Exposure* - being exposed to ionizing radiation or to radioactive material (10 CFR 20.1003).
- *External Dose* - that portion of the dose equivalent received from radiation sources outside the body (10 CFR 20.1003).
- *Extremity* - hand, elbow, arm below the elbow, foot, knee, or leg below the knee (10 CFR 20.1003).
- *Eye Dose Equivalent* - applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm (300 mg/cm<sup>2</sup>) (10 CFR 20.1003).
- *Generally Applicable Environmental Radiation Standards* - standards issued by the U.S. Environmental Protection Agency (USEPA) under the authority of the *Atomic Energy Act* of 1954, as amended, that impose limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment, outside the boundaries of locations under the control of persons possessing or using radioactive material (10 CFR 20.1003).
- *Government Agency* - any executive department, commission, independent establishment, corporation wholly or partly owned by the United States of America, which is an instrumentality of the United States, or any board, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government (10 CFR 20.1003).
- *Gray* - the sievert (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 J/kg (100 rads) (10 CFR 20.1004).
- *High Radiation Area (HRA)* - an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 h at 30 cm [11.81 in.] from the radiation source or from any surface that the radiation penetrates (10 CFR 20.1003).
- *Individual* - any human being (10 CFR 20.1003).

- *Individual Monitoring* - (10 CFR 20.1003)
  1. the assessment of dose equivalent by the use of devices designed to be worn by an individual
  2. the assessment of committed effective dose equivalent by bioassay (see Bioassay) or by determination of the time-weighted air concentrations to which an individual has been exposed (i.e., DAC-hours)
  3. the assessment of dose equivalent by the use of survey data.
- *Individual Monitoring Devices (Individual Monitoring Equipment)* - devices designed to be worn by a single individual for the assessment of dose equivalent such as film badges, thermoluminescent dosimeters (TLDs), pocket ionization chambers, and personal (lapel) air sampling devices (10 CFR 20.1003).
- *Internal Dose* - that portion of the dose equivalent received from radioactive material taken into the body (10 CFR 20.1003).
- *License* - a license issued under the regulations in 10 CFR parts 30 through 36, 39, 40, 50, 60, 61, 70 (10 CFR 20.1003).
- *Licensed Material* - source material, special nuclear material, or by-product material received, possessed, used, transferred or disposed of under a general or specific license issued by the Commission (10 CFR 20.1003).
- *Limits (dose limits)* - the permissible upper bounds of radiation doses (10 CFR 20.1003).
- *Lost or Missing Licensed Material* - licensed material whose location is unknown. It includes material that has been shipped but has not reached its destination and whose location cannot be readily traced in the transportation system (10 CFR 20.1003).
- *Member of the Public* - any individual except when that individual is receiving an occupational dose, except as delineated in other parts of 10 CFR chapter I (10 CFR 20.1003).
- *Monitoring (Radiation Monitoring, Radiation Protection Monitoring)* - the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses (10 CFR 20.1003).
- *Nonstochastic Effect* - health effects, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect (also called a deterministic effect) (10 CFR 20.1003).
- *NRC* - the Nuclear Regulatory Commission or its duly authorized representatives (10 CFR 20.1003).
- *Occupational Dose* - the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the installation or other person. Occupational dose does not include dose received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released, from voluntary participation in medical research programs, or as a member of the public (10 CFR 20.1003).
- *Person* -
  1. Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy, any state, or any political subdivision of any such government of nation, or other entity.
  2. Any legal successor, representative, agent, or agency of the foregoing (10 CFR 20.1003).
- *Planned Special Exposure* - an infrequent exposure to radiation, separate from, and in addition to, the annual dose limits (10 CFR 20.1003).

- *Public Dose* - the dose received by a member of the public from exposure to radiation or radioactive material released by an installation, or to any other source of radiation under the control of the installation. Public dose does not include occupational dose or doses received from background radiation, from exposure to individuals administered radioactive material and released, from any medical administration the individual has received, or from voluntary participation in medical research programs (10 CFR 20.1003).
- *Quality Factor (Q)* - the modifying factor (listed in Tables 1004(b).1 and 1004(b).2 of 10 CFR 20.1004) (see Appendix 19-1 and Appendix 19-2) that is used to derive dose equivalent from absorbed dose (10 CFR 20.1003)

(NOTE: If it is more convenient to measure the neutron fluence rate than to determine the neutron dose equivalent rate in rems per hour or sieverts per hour, 1 rem (0.01 Sv) of neutron radiation of unknown energies may, for purposes of the regulations in this part, be assumed to result from a total fluence of 25 million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, the installation may use the fluence rate per unit dose equivalent or the appropriate Q value from Appendix 19-2 to convert a measured tissue dose in rads to dose equivalent in rems.)

- *Rad* - the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/g or 0.01 J/kg (0.01 gray) (10 CFR 20.1004).
- *Radiation (Ionizing Radiation)* - alpha particles, beta particles, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in 10 CFR 20, does not include nonionizing radiation, such as radio or microwaves, or visible, infrared, or ultraviolet light (10 CFR 20.1003).
- *Radiation Area (RA)* - an area accessible to individuals in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 h at 30 cm [11.81 in.] from the radiation source or from any surface that the radiation penetrates (10 CFR 20.1003).
- *Reference Man* - a hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base (10 CFR 20.1003).
- *rem* - the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in terms of rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 Sv) (10 CFR 20.1004).
- *Respiratory Protective Device* - an apparatus, such as a respirator, used to reduce the individual's intake of airborne radioactive materials (10 CFR 20.1003).
- *Restricted Area* - an area, access to which is limited by the installation for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area (10 CFR 20.1003).
- *Sanitary Sewerage* - a system of public sewers for carrying off wastewater and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the installation (10 CFR 20.1003).
- *Shallow-Dose Equivalent (H<sub>s</sub>)* - applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm<sup>2</sup>) averaged over an area of 1 cm<sup>2</sup> (10 CFR 20.1003).
- *Sievert (Sv)* - the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rems) (10 CFR 20.1004).

- *Significantly Irradiated* - for any organ or tissue, the product of the weighting factor,  $W_T$ , and the committed dose equivalent,  $H_{T50}$ , per unit intake is greater than 10 percent of the maximum weighted value of  $H_{T50}$ . (i.e.,  $W_T H_{T50}$  per unit intake for any organ or tissue (10 CFR 20.1202(b)(3)).
- *Site Boundary* - that line beyond which the land or property is not owned, leased, or otherwise controlled by the installation (10 CFR 20.1003).
- *Source Material* -
  1. uranium or thorium or any combination of uranium and thorium in any physical or chemical form
  2. ores that contain, by weight, one-twentieth of 1 percent (0.05 percent), or more, of uranium, thorium, or any combination of uranium and thorium. Source material does not include special nuclear material (10 CFR 20.1003).
- *Special Form Radioactive Material* - radioactive material that satisfies the following conditions:
  1. It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule.
  2. The piece or capsule has at least one dimension not less than 5 mm (0.197 in.).
  3. It satisfies the test requirements of 10 CFR 71.75.

A special form encapsulation designed in accordance with the requirements of 10 CFR 71.4(o) in effect on 30 June 1983, and constructed prior to 1 July 1985, may continue to be used. A special form encapsulation either designed or constructed after 30 June 1985 must meet requirements of this definition applicable at the time of its design or construction (10 CFR 71.4).

- *Special Nuclear Material* -
  1. Plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the Commission determines to be special nuclear material but does not include source material.
  2. Any material artificially enriched by any of the foregoing but does not include source material (10 CFR 20.1003).
- *Stochastic Effects* - health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects (10 CFR 20.1003).
- *Survey* - an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources or radiation. When appropriate, such an evaluation includes a physical survey of the location or radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present (10 CFR 20.1003).
- *Total Effective Dose Equivalent (TEDE)* - The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures) (10 CFR 20.1003).
- *Type A Quantity* - a quantity of radioactive material, the aggregate radioactivity of which does not exceed  $A_1$  for special form radioactive material or  $A_2$  for normal form radioactive material, where  $A_1$  and  $A_2$  are given in Appendix 19-3 (10 CFR 71.4).
- *Type B Quantity* - a quantity of radioactive material greater than a Type A quantity (10 CFR 71.4).
- *Unrestricted Area* - an area, access to which is neither limited nor controlled by the installation (10 CFR 20.1003).

- *Uranium Fuel Cycle* - the operations of mining of uranium ore, chemical conversion of uranium, isotopic enrichment of uranium, fabrication of uranium fuel, generation of electricity by a light-water-cooled nuclear power plant using uranium fuel, and reprocessing of spent uranium fuel to the extent that these activities directly support the production of electrical power for public use. Uranium fuel cycle does not include mining operations, operations at waste disposal sites, transportation of radioactive material in support of these operations, and the reuse of recovered nonuranium special nuclear and by-product materials from the cycle (10 CFR 20.1003).
- *Very High Radiation Area (VHRA)* - an area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 h at 1 m [3.28 ft] from any surface that the radiation penetrates (10 CFR 20.1003).

(NOTE: At very high doses received at high dose rates, units of absorbed dose (e.g., rads and grays) are appropriate, rather than units of dose equivalent (e.g., rems and sieverts).)

- *Waste Oils* - petroleum derived or synthetic oils used principally as lubricants, coolants, hydraulic or insulating fluids, or metalworking oils (10 CFR 20.2004(b)(1)).
- *Week* - seven consecutive days starting on Sunday (10 CFR 20.1003).
- *Weighting Factor ( $W_T$ ) for an Organ or Tissue* - the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, see Appendix 19-4 (10 CFR 20.1003).
- *Whole Body* - for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee (10 CFR 20.1003).
- *Working Level (WL)* - any combination of short-lived radon daughters (for radon-222: polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212) in 1 L [0.043 m<sup>3</sup>] of air that will result in the ultimate emission of  $1.3 \times 10^5$  MeV of potential alpha particle energy (10 CFR 20.1003).
- *Working Level Month (WLM)* - an exposure to one working level for 170 h (2000 working hours per year/12 mo/yr = approximately 170 h/mo) (10 CFR 20.1003).
- *Year* - the period of time beginning in January used to determine compliance with the provisions of 10 CFR 20. The installation may change the starting date of the year used to determine compliance by the installation provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years (10 CFR 20.1003).



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Radiation Dose Limits for Members of the Public	IR.30.1 and IR.30.2	19-15
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Addendum 19-3, <i>Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests</i>	19-111

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<p><b>IR.10</b> <b>RADIATION PROTECTION PROGRAM</b></p> <p><b>IR.10.1.</b> Installations must have a radiation protection program that meets specific requirements (10 CFR 20.1101).</p>	<p>Verify that the installation develops, documents, and implements a radiation protection program that reflects the scope and extent of the installation's activities.</p> <p>Verify that the installation uses, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the general public that are ALARA.</p> <p>Verify that, to implement this ALARA requirement, a constraint on air emissions of radioactive material to the environment is established by licensees other than constructors of nuclear reactors, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per yr from these emissions.</p> <p>(NOTE: This requirement applies notwithstanding the requirements in 10 CFR 20.1301 (see the checklist items in IR.30).)</p> <p>(NOTE: This requirement does not apply to Radon-222 and its daughters.)</p> <p>Verify that, if this dose constraint is exceeded, the licensee:</p> <ul style="list-style-type: none"> <li>- reports the exceedance as provided in 10 CFR 20.2203 (see checklist items IR.200.7 through IR.200.11)</li> <li>- promptly takes appropriate corrective action to ensure against recurrence.</li> </ul> <p>Verify that the radiation protection program is reviewed at least annually.</p>



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<p><b>IR.20</b>  <b>OCCUPATIONAL DOSE LIMITS</b></p> <p><b>IR.20.1.</b> Installations must comply with limits on the occupational dose to individual adults (10 CFR 20.1201 (a)).</p> <p><b>IR.20.2.</b> Installations must ensure that the dose to an embryo/fetus does not exceed certain limits (10 CFR 20.1208(a) and (b)).</p> <p><b>IR.20.3.</b> Installations must limit an individual's soluble uranium intake (10 CFR 20.1201(e)).</p>	<p>Verify that the occupational dose for individual adults falls below the annual limit, which is the more limiting of:</p> <ul style="list-style-type: none"> <li>- the total effective dose equivalent being equal to 5 rems (0.05 Sv), or</li> <li>- the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems (0.50 Sv).</li> </ul> <p>Verify that the installation complies with the following annual limits to the lens of the eye, to the skin, and to the extremities:</p> <ul style="list-style-type: none"> <li>- an annual eye dose equivalent limit of 15 rems (0.15 Sv) and</li> <li>- an annual shallow dose equivalent limit to the skin or to any extremity of 50 rems (0.50 Sv).</li> </ul> <p>(NOTE: These limits do not include planned special exposures.)</p> <p>Verify that the dose to an embryo/fetus during an entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv).</p> <p>Verify that the installation makes efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to comply with the specified 0.5 rem (5 mSv) limit.</p> <p>Verify that no individual's intake of soluble uranium exceeds 10 mg/week.</p>



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<p><b>IR.30</b>  <b>RADIATION DOSE LIMITS FOR MEMBERS OF THE PUBLIC</b></p> <p><b>IR.30.1.</b> Installations must not exceed the specified total effective dose equivalent to individual members of the public (10 CFR 20.1301(a)(1)).</p> <p><b>IR.30.2.</b> The total effective dose equivalent in an unrestricted area must be kept within certain limits. (10 CFR 20.1301(a)(2) and (b)).</p>	<p>(NOTE: Compliance with the provisions in IR.30 does not release the installation from obligations to comply with the USEPA's generally applicable environmental radiation standards in 40 CFR 190.)</p> <p>(NOTE: The Commission may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that an installation may release in effluents in order to restrict the collective dose.)</p> <p>Verify that the total effective dose equivalent to individual members of the public from the installation's operation does not exceed 0.1 rem (1 mSv) in a year.</p> <p>(NOTE: The total effective dose equivalent to individual members of the public does not include the dose contribution from background radiation, any medical administration the individual has received, from exposure to individuals administered radioactive material and released, voluntary participation in medical research programs, or the installation's disposal of radioactive material into sanitary sewerage.)</p> <p>Verify that the total effective dose equivalent to individual members of the public in any unrestricted area from external sources does not exceed 0.002 rem (0.02 mSv) in any 1 h.</p> <p>(NOTE: If the installation permits members of the public to have access to controlled areas, the limits for members of the public continue to apply to those individuals.)</p>



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<p><b>IR.40</b>  <b>PLANNED SPECIAL EXPOSURES</b></p> <p><b>IR.40.1.</b> Installations must satisfy certain conditions before authorizing any planned special exposure (10 CFR 20.1206(a) and (b)).</p> <p><b>IR.40.2.</b> Installations must supply specific information to individuals involved in a planned special exposure (10 CFR 20.1206(c)(1) through (c)(3)).</p> <p><b>IR.40.3.</b> Installations must obtain the prior dose history for each individual involved prior to the planned special exposure (10 CFR 20.1206 (d)).</p> <p><b>IR.40.4.</b> Installations must not authorize a planned special exposure that would exceed certain limits (10 CFR 20.1206(e)(1) and (e)(2)).</p> <p><b>IR.40.5.</b> Installations must maintain and submit records of any planned special exposure in accordance with certain standards (10 CFR 20.1206(f)).</p>	<p>Verify that the installation authorizes planned special exposures only in exceptional situations when alternatives that might avoid higher exposure are unavailable or impractical.</p> <p>Verify that the installation (and employer if the employer is not the installation) specifically authorizes the planned special exposure, in writing, before the exposure occurs.</p> <p>Verify that the installation informs all involved individuals regarding:</p> <ul style="list-style-type: none"> <li>- the purpose of the planned operation</li> <li>- the estimated doses and associated risks and specific radiation levels or other conditions that might be involved in performing the task</li> <li>- the measures to be taken to keep the dose ALARA considering other risks that may be present.</li> </ul> <p>Verify that the installation ascertains the prior dose history for each individual involved as required by 10 CFR 20.2104(b) (see checklist item IR.180.8).</p> <p>Verify that the dose level for any planned special exposure does not exceed:</p> <ul style="list-style-type: none"> <li>- the numerical values of any of the dose limits in 10 CFR 20.1201(a) (see checklist item IR.20.1) in any year</li> <li>- five times the annual dose limits in 10 CFR 20.1201(a) (see checklist item IR.20.1) during the individual's lifetime.</li> </ul> <p>Verify that the installation maintains records of the conduct of a planned special exposure in accordance with the requirements in 10 CFR 20.2105 (see checklist items IR.180.12 and IR.180.13).</p> <p>Verify that the installation submits a written report in accordance with 10 CFR 20.2204 (see checklist item IR.200.12).</p>

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<b>IR.40.6.</b> Installations must communicate to each individual involved the best estimate of the dose resulting from any planned special exposure (10 CFR 20.1206 (g)).	<p>Verify that the installation informs the individual involved, in writing, of the dose within 30 days from the date of the planned special exposure.</p> <p>Verify that the installation records the dose in the written record of the individual.</p> <p>(NOTE: The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual under 10 CFR 20.1201 (see checklist items IR.20.1 and IR.20.3), but is to be included in evaluations required by 10 CFR 20.1206(d) and (e) (see checklist items IR.40.3 and IR.40.4.)</p>

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<p><b>IR.50</b>  <b>SURVEYS AND MONITORING</b></p> <p><b>IR.50.1.</b> Installations must make, or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas (10 CFR 20.1302(d)).</p> <p><b>IR.50.2.</b> Installations must, under certain circumstances, make, or cause to be made, surveys that are both necessary and reasonable to evaluate specific factors (10 CFR 20.1501(a)(1) and (a)(2)).</p> <p><b>IR.50.3.</b> Certain instruments and equipment must be calibrated periodically (10 CFR 20.1501(b)).</p> <p><b>IR.50.4.</b> Installations must process and evaluate all personnel dosimeters with a dosimetry processor that meets certain standards (10 CFR 20.1501(c)).</p>	<p>Verify that the installation makes or causes to be made surveys measuring:</p> <ul style="list-style-type: none"> <li>- radiation levels in unrestricted and controlled areas</li> <li>- radioactive materials in effluents released to unrestricted and controlled areas.</li> </ul> <p>Determine whether a survey is necessary in order to comply with the requirements of this protocol.</p> <p>Verify that, if necessary, surveys are conducted to evaluate:</p> <ul style="list-style-type: none"> <li>- the extent of radiation levels</li> <li>- concentrations or quantities of radioactive material</li> <li>- the potential radiological hazards that could be present.</li> </ul> <p>Verify that instruments and equipment used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated periodically for the radiation measured.</p> <p>Determine whether personnel dosimeters require processing to determine radiation dose.</p> <p>Determine whether personnel dosimeters are used to comply with:</p> <ul style="list-style-type: none"> <li>- the regulations included in 10 CFR 20.1201 (see checklist items IR.20.1 and IR.20.3)</li> <li>- other applicable provisions</li> <li>- conditions specified in the license.</li> </ul> <p>Verify that dosimeters that meet the above criteria are processed and evaluated by a dosimeter processor that:</p> <ul style="list-style-type: none"> <li>- holds current personal dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology</li> <li>- is approved in this accreditation process for the type of radiation or</li> </ul>

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<p><b>IR.50.5.</b> Installations must meet certain requirements with regard to monitoring exposures to radiation and radioactive material (10 CFR 20.1502(a)(1) through (a)(3)).</p>	<p>tions included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.</p> <p>(NOTE: This requirement does not apply to direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to the extremities.)</p> <p>Verify that, at a minimum, the installation monitors occupational exposure to radiation and supplies and requires the use of individual monitoring devices by:</p> <ul style="list-style-type: none"> <li>- adults likely to receive, in 1 yr from sources external to the body, a dose in excess of 10 percent of the limits in 10 CFR 20.1201(a) (see checklist item IR.20.1)</li> <li>- declared pregnant women likely to receive, in 1 yr from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in 10 CFR 20.1208 (see checklist item IR.20.2)</li> <li>- individuals entering a high or very high radiation area.</li> </ul>
<p><b>IR.50.6.</b> Installations must monitor the occupational intake of radioactive material by and assess the committed effective dose equivalent to specific individuals (10 CFR 20.1502(b)(1) and (b)(2)).</p>	<p>Verify that the installation monitors the occupational intake of radioactive material by and assesses the committed dose equivalent for:</p> <ul style="list-style-type: none"> <li>- adults likely to receive, in 1 yr, an intake in excess of 10 percent of the applicable ALI(s) in Table 1, Columns 1 and 2, of Appendix B to 10 CFR 20</li> <li>- declared pregnant women likely to receive, in 1 yr, a committed effective dose equivalent in excess of 0.05 rem (0.5 mSv).</li> </ul>

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<p><b>IR.60</b>  <b>CONTROL OF EXPOSURE FROM EXTERNAL SOURCES IN RESTRICTED AREAS</b></p> <p><b>IR.60.1.</b> Installations must ensure that each entrance or access point to an HRA has certain features (10 CFR 20.1601(a)(1) through (a)(3), (b), and (c)).</p> <p><b>IR.60.2.</b> Installations must establish access controls that do not prevent individuals from leaving a high radiation area (10 CFR 20.1601(d) through (f)).</p>	<p>Verify that each entrance or access point to an HRA has one or more of the following features:</p> <ul style="list-style-type: none"> <li>- a control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep-dose equivalent of 0.1 rem (1 mSv) in 1 h at 30 cm [approximately 11.81 in.] from the radiation source or from any surface that the radiation penetrates</li> <li>- a control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the HRA and the supervisor of the activity are made aware of the entry</li> <li>- entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.</li> </ul> <p>(NOTE: In place of the controls noted above for an HRA, the installation may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.)</p> <p>(NOTE: An installation may apply to the Commission for approval of alternative methods of controlling access to HRAs.)</p> <p>Verify that the required access control devices do not prevent individuals from leaving HRAs.</p> <p>(NOTE: Control is not required for each entrance or access point to a room or other area that is an HRA solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with the regulations of the Department of Transportation provided that:</p> <ul style="list-style-type: none"> <li>- the packages do not remain in the area longer than 3 days</li> <li>- the dose rate at 1 m [approximately 3.28 ft] from the external surface of any package does not exceed 0.01 rem (0.1 mSv)/h.)</li> </ul> <p>(NOTE: Control of entrance or access to rooms or other areas in hospitals is not required solely because of the presence of patients containing radioactive material, provided that there are personnel in attendance who will take the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the limits established here and to operate within the ALARA provisions of the installation's radiation protection program.)</p>

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<b>IR.60.3.</b> Installations must institute additional measures to control access to VHRAs (10 CFR 20.1602).	<p>Determine whether the installation has any areas where radiation levels are at or above 500 rads (5 grays) in 1 h at 1 m [approximately 3.28 ft] from a radiation source or any surface through which the radiation penetrates.</p> <p>Verify that, in addition to the HRA controls, measures are taken to prevent unauthorized or inadvertent access to the VHRA.</p>

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<p><b>IR.70</b>  <b>RESPIRATORY PROTECTION AND CONTROLS TO RESTRICT INTERNAL EXPOSURE IN RESTRICTED AREAS</b></p> <p><b>IR.70.1.</b> Installations must use, to the extent practical, specific processes to control the concentrations of radioactive material in the air (10 CFR 20.1701).</p> <p><b>IR.70.2.</b> Installations must, under certain circumstances, increase monitoring and limit intakes by specific means (10 CFR 20.1702(a) through (d)).</p> <p><b>IR.70.3.</b> Respiratory protection equipment must be certified (10 CFR 20.1703(a)(1) and (a)(2)).</p>	<p>Verify that the installation uses process or other engineering controls (e.g., containment or ventilation) that control the concentrations of radioactive material in the air.</p> <p>Determine whether it is impractical to apply process or other engineering controls to control the concentrations of radioactive material in the air to values below those that define an airborne radioactivity area.</p> <p>Verify that the installation, consistent with maintaining the total effective dose equivalent ALARA, increases monitoring and limits intakes by one or more of the following means:</p> <ul style="list-style-type: none"> <li>- control of access</li> <li>- limitation of exposure times</li> <li>- use of respiratory protection equipment</li> <li>- other controls.</li> </ul> <p>Determine whether the installation uses respiratory protection equipment to limit intakes in accordance with 10 CFR 20.1702 (see checklist item IR.70.2).</p> <p>Verify that the respiratory protection equipment is tested and certified or has been certified by the NIOSH/MSHA.</p> <p>(NOTE: If the installation wishes to use equipment that has not been tested or certified by NIOSH/MSHA, has not had certification extended by NIOSH/MSHA, or for which there is no schedule for testing or certification, the installation must submit an application for authorized use of that equipment, including a demonstration by testing, or a demonstration on the basis of reliable test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use.)</p>

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<p><b>IR.70.4.</b> A respiratory protection program that includes specific components must be implemented and maintained (10 CFR 20.1703 (a)(3)(i) through (a)(3)(v)).</p>	<p>Verify that the installation has implemented and maintains a respiratory protection program that includes:</p> <ul style="list-style-type: none"> <li>- air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures</li> <li>- surveys and bioassays, as appropriate, to evaluate actual intakes</li> <li>- testing of respirators for operability immediately prior to each use</li> <li>- written procedures regarding: <ul style="list-style-type: none"> <li>- selection, fitting, issuance, maintenance, and testing of respirators, including testing for operability immediately prior to each use</li> <li>- supervision and training of personnel</li> <li>- monitoring, including air sampling and bioassays</li> <li>- recordkeeping</li> </ul> </li> <li>- determination by a physician prior to the initial fitting of respirators, and either every 12 mo thereafter or periodically at a frequency determined by a physician, that the individual user is medically fit to use the respiratory protection equipment.</li> </ul>
<p><b>IR.70.5.</b> Installations must issue a written policy statement on respirator usage which includes specific components (10 CFR 20.1703 (a)(4)).</p>	<p>Verify that the installation issues a written policy statement on respirator usage which covers the following:</p> <ul style="list-style-type: none"> <li>- the use of process or other engineering controls, instead of respirators</li> <li>- the routine, nonroutine, and emergency use of respirators</li> <li>- the periods of respirator use and relief from respirator use.</li> </ul>
<p><b>IR.70.6.</b> Each respirator user must be advised that the user may leave the area at any time, under specific circumstances, for relief from respirator use (10 CFR 20.1703(a)(5)).</p>	<p>Verify that each respirator user is advised that he or she may leave the area at any time for relief from respirator use in the event of:</p> <ul style="list-style-type: none"> <li>- equipment malfunction</li> <li>- physical or psychological distress</li> <li>- procedural or communication failure</li> <li>- significant deterioration of operating conditions</li> <li>- any other conditions that might require such relief.</li> </ul>
<p><b>IR.70.7.</b> Respiratory protection equipment must meet certain standards with regard to limitations and capabilities (10 CFR 20.1703(a)(6)).</p>	<p>Verify that respiratory protection equipment is used within limitations for type and mode of use.</p> <p>Verify that the respiratory protection provides proper visual, communication, and other special capabilities (such as adequate skin protection) when needed.</p>
<p><b>IR.70.8.</b> Installations must use as emergency devices only properly certified respiratory protection equipment (10 CFR 20.1703(c)).</p>	<p>Verify that only respiratory protection equipment which is specifically certified by or has had certification extended for emergency use by NIOSH/MSHA is used as emergency devices.</p>

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<p><b>IR.70.9.</b> Installations must notify the Regional Administrator prior to using any respiratory protection equipment (10 CFR 20.1703 (d)).</p>	<p>Verify that the installation notifies, in writing, the Regional Administrator of the appropriate NRC Regional Office listed in Appendix 19-5 at least 30 days before the date that respiratory protection equipment is first used under the provisions of either 10 CFR 20.1703(a) or (b) (see checklist items IR.70.3 through IR.70.7 and Addendum 19-1, Section VI).</p> <p>Verify that the notification is made in writing.</p>



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<p><b>IR.80</b>  <b>STORAGE AND CONTROL OF LICENSED MATERIAL</b></p> <p><b>IR.80.1.</b> Installations must secure licensed materials that are stored in controlled or unrestricted areas (10 CFR 20.1801).</p> <p><b>IR.80.2.</b> Installations must control and maintain constant surveillance of licensed material not in storage (10 CFR 20.1802).</p>	<p>Verify that licensed materials that are stored in a controlled or unrestricted area are secure from unauthorized removal or access.</p> <p>Verify that the installation controls and maintains constant surveillance of licensed material that is in a controlled or uncontrolled area and that is not in storage.</p>



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<p><b>PRECAUTIONARY PROCEDURES</b></p> <p><b>IR.90</b> <b>Posting Requirements</b></p> <p><b>IR.90.1.</b> Installations must post each RA with specific identification (10 CFR 20.1902(a)).</p> <p><b>IR.90.2.</b> Installations must post each HRA with specific identification (10 CFR 20.1902(b)).</p> <p><b>IR.90.3.</b> Installations must post each VHRA with specific identification (10 CFR 20.1902(c)).</p> <p><b>IR.90.4.</b> Installations must post each ARA with specific identification (10 CFR 20.1902(d)).</p>	<p>(NOTE: In addition to the contents of signs and labels prescribed here, the installation may provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.)</p> <p>Verify that each RA is identified with a conspicuous sign or signs bearing the radiation symbol and the words:</p> <p style="text-align: center;">CAUTION, RADIATION AREA</p> <p>Verify that each HRA is identified with a conspicuous sign or signs bearing the radiation symbol and the words:</p> <p style="text-align: center;">CAUTION, HIGH RADIATION AREA</p> <p style="text-align: center;">or</p> <p style="text-align: center;">DANGER, HIGH RADIATION AREA.</p> <p>Verify that each VHRA is identified with a conspicuous sign or signs bearing the radiation symbol and the words:</p> <p style="text-align: center;">GRAVE DANGER, VERY HIGH RADIATION AREA.</p> <p>Verify that each ARA is identified with a conspicuous sign or sign bearing the radiation symbol and the words:</p> <p style="text-align: center;">CAUTION, AIRBORNE RADIOACTIVITY AREA</p> <p style="text-align: center;">or</p> <p style="text-align: center;">DANGER, AIRBORNE RADIOACTIVITY AREA.</p>

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<p><b>IR.90.5.</b> Installations must post each area or room in which a specific amount of licensed material is used or stored with specific identification (10 CFR 20.1902(e) and (a) through (c)).</p>	<p>Determine that the quantity of licensed material in the area or room exceeds 10 times the quantity of such material specified in Appendix 19-6.</p> <p>Verify that each area or room in which there is used or stored licensed material is identified with a conspicuous sign or signs bearing the radiation symbol and the words:</p> <p style="text-align: center;">CAUTION, RADIOACTIVE MATERIAL(S)</p> <p style="text-align: center;">or</p> <p style="text-align: center;">DANGER, RADIOACTIVE MATERIAL(S).</p> <p>(NOTE: The installation is not required to post caution signs in areas or rooms containing radioactive materials for periods of less than 8 h, if each of the following conditions is met:</p> <ul style="list-style-type: none"> <li>- the materials are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to radiation or radioactive materials in excess of the limits established in 10 CFR 20</li> <li>- the area or room is subject to the installation's control.)</li> </ul> <p>(NOTE: Rooms or other areas in hospitals that are occupied by patients need not be posted with caution signs provided that the patient could be released from the confinement because under one of the following conditions:</p> <ul style="list-style-type: none"> <li>- the measured dose rate from the patient is less than 5 mrem/h at a distance of 1 m [approximately 3.28 ft]</li> <li>- the activity in the patient is less than 30 mCi</li> <li>- the measured dose rate of a patient with a permanent implant is less than 5 mrem/h at a distance of 1 m [approximately 3.28 ft].)</li> </ul> <p>(NOTE: A room or area need not be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 cm [approximately 11.81 in.] from the surface of the source container or housing does not exceed 0.005 rem (0.05 mSv)/h.)</p>

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<p><b>PRECAUTIONARY PROCEDURES</b></p> <p><b>IR.100</b> <b>Labeling Containers</b></p> <p><b>IR.100.1.</b> Installations must ensure that each container of licensed material is clearly identified according to specific standards (10 CFR 20.1904(a)).</p>	<p>(NOTE: An installation is not required to label:</p> <ul style="list-style-type: none"> <li>- containers holding licensed material in quantities less than the quantities listed in Appendix 19-6</li> <li>- containers holding licensed material in concentrations less than those specified in Table 3 of Appendix B to 10 CFR 20</li> <li>- containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by this part</li> <li>- containers when they are in transport and packaged and labeled in accordance with the regulations of the Department of Transportation</li> <li>- containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record (examples of containers of this type are containers in locations such as water-filled canals, storage vaults, or hot cells); the record must be retained as long as the containers are in use for the purpose indicated on the record</li> <li>- installed manufacturing or process equipment, such as reactor components, piping, and tanks.)</li> </ul> <p>Verify that each container of licensed material is identified with a durable, clearly visible label that contains:</p> <ul style="list-style-type: none"> <li>- the radiation symbol and the words:</li> </ul> <p style="text-align: center;">CAUTION, RADIOACTIVE MATERIAL or DANGER, RADIOACTIVE MATERIAL</p> <ul style="list-style-type: none"> <li>- sufficient information to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposure.</li> </ul> <p>(NOTE: Examples of such information are:</p> <ul style="list-style-type: none"> <li>- radionuclide(s) present</li> <li>- an estimate of the quantity of radioactivity</li> <li>- the date for which the activity is estimated</li> <li>- radiation levels</li> <li>- kinds of materials</li> <li>- mass enrichment.)</li> </ul>

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<b>IR.100.2.</b> Labels on empty or contaminated containers must be removed or defaced prior to removal or disposal (10 CFR 20.1904(b) and (a) through (f)).	Determine whether empty uncontaminated containers will be disposed of or removed to unrestricted areas.  Verify that the installation removes or defaces the radioactive material label or otherwise clearly indicates that the container no longer contains radioactive materials.

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<p><b>PRECAUTIONARY PROCEDURES</b></p> <p><b>IR.110</b>  <b>Receiving and Opening Packages</b></p> <p><b>IR.110.1.</b> Installations must follow specific procedures when receiving a package containing radioactive material (10 CFR 20.1906(a)).</p> <p><b>IR.110.2.</b> Installations must monitor labeled packages for radioactive contamination and radiation levels (10 CFR 20.1906(b)(1) and 20.1906(b)(2)).</p> <p><b>IR.110.3.</b> Installations must monitor all packages known to contain radioactive material according to specific guidelines (10 CFR 20.1906(b)(3) and (f)).</p>	<p>Determine whether the package contains quantities of radioactive material in excess of a Type A quantity.</p> <p>Verify that the installation receives one of the following:</p> <ul style="list-style-type: none"> <li>- the package when the carrier offers it for delivery</li> <li>- notification of the arrival of the package at the carrier's terminal, whereupon the installation must take possession of the package expeditiously.</li> </ul> <p>Verify that the installation monitors the external surfaces of labeled packages for radioactive contamination.</p> <p>(NOTE: This requirement applies to packages labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. DOT regulations, 49 CFR 172.403 and 172.436-440.)</p> <p>(NOTE: This requirement does not apply if the package contains only radioactive material in the form of a gas or in special form as defined in 10 CFR 71.4.)</p> <p>Verify that the installation monitors the external surfaces of labeled packages for radiation levels.</p> <p>(NOTE: This requirement does not apply to packages containing quantities of radioactive material that are less than or equal to the Type A quantity.)</p> <p>Verify that the installation monitors all such packages for radioactive contamination and radiation levels if there is evidence of degradation of package integrity.</p> <p>(NOTE: Examples of degradation include packages that are:</p> <ul style="list-style-type: none"> <li>- crushed</li> <li>- wet</li> <li>- damaged.)</li> </ul> <p>(NOTE: Installations transferring special form sources in installation-owned or installation-operated vehicles to and from a work site are exempt from the contamination monitoring requirements, but are not exempt from the survey requirement for measuring radiation levels that is required to ensure that the source</p>

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<p><b>IR.110.4.</b> Installations must expeditiously monitor labeled packages and packages known to contain radioactive material (10 CFR 20.1906(c)).</p> <p><b>IR.110.5.</b> Installations must notify appropriate authorities when packages exceed specific radiation levels (10 CFR 20.1906(d) and 10 CFR 71.47).</p>	<p>is still properly lodged in its shield.)</p> <p>Verify that the installation monitors such packages as soon as practical after receipt, but not later than:</p> <ul style="list-style-type: none"> <li>- 3 h after receipt at the installation if received during the installation's normal working hours</li> <li>- 3 h from the beginning of the next working day if received after working hours.</li> </ul> <p>Verify that the installation immediately notifies the final delivery carrier and, by telephone and telegram, mailgram, or facsimile, the Administrator of the appropriate NRC Regional Office when either:</p> <ul style="list-style-type: none"> <li>- removable radioactive surface contamination exceeds the limits of Appendix 19-7</li> <li>- external radiation levels exceed 200 mrem/h.</li> </ul> <p>(NOTE: For a package transported as exclusive use by rail, highway, or water, radiation levels external to the package may exceed the above limits, but must not exceed any of the following:</p> <ul style="list-style-type: none"> <li>- 200 mrem/h on the accessible external surface of the package unless the following conditions are met, in which case the limit is 1000 mrem/h: <ul style="list-style-type: none"> <li>- the shipment is made in a closed transport vehicle</li> <li>- provisions are made to secure the package so that its position within the transport vehicle remains fixed during transportation</li> <li>- there are no loading or unloading operations between the beginning and end of the transportation</li> </ul> </li> <li>- 200 mrem/h at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle</li> <li>- 10 mrem/h at any point 2 m [approximately 6.61 ft] from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of an open vehicle, at any point 2 m [approximately 6.61 ft] from the vertical planes projected from the outer edges of the conveyance</li> <li>- 2 mrem/h in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, professional radiation exposure monitoring devices, and special training.)</li> </ul>

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<b>IR.110.6.</b> Installations must employ specific procedures for safely opening packages that contain radioactive material (10 CFR 20.1906 (e)).	<p>Verify that the installation establishes, maintains, and retains written procedures for safely opening packages in which radioactive material is received.</p> <p>Verify that the installation follows the established procedures.</p> <p>Verify that due consideration is given to special instructions for the type of package being opened.</p>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.120</b> <b>General</b></p> <p><b>IR.120.1.</b> Installations may dispose of licensed material by certain methods only (10 CFR 20.2001(a) and 20.2002).</p> <p><b>IR.120.2.</b> Persons who receive waste that contains licensed material from other persons for certain purposes must be specifically licensed (10 CFR 2001(b)).</p>	<p>(NOTE: Nothing in this section relieves the installation from complying with other applicable Federal, state, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this section.)</p> <p>Verify that the installation uses no disposal methods other than the following:</p> <ul style="list-style-type: none"> <li>- decay in storage</li> <li>- release in effluents</li> <li>- release into sanitary sewerage</li> <li>- treatment or disposal by incineration</li> <li>- disposal at a licensed land disposal facility</li> <li>- disposal at a geologic repository</li> <li>- transfer to an authorized recipient.</li> </ul> <p>(NOTE: An installation may apply to the Commission for approval of proposed procedures, not otherwise authorized, to dispose of licensed material generated in the installation's activities. Each application must include:</p> <ul style="list-style-type: none"> <li>- a description of the waste-containing licensed material to be disposed of, including the physical and chemical properties important to risk evaluation, and the proposed manner and conditions of waste disposal</li> <li>- an analysis and evaluation of pertinent information on the nature of the environment</li> <li>- the nature and location of other potentially affected facilities</li> <li>- analyses and procedures to ensure that doses are maintained ALARA and within allowable dose limits.)</li> </ul> <p>Verify that persons who receive waste that contains licensed material for the following purposes are specifically licensed:</p> <ul style="list-style-type: none"> <li>- treatment prior to disposal</li> <li>- treatment or disposal by incineration</li> <li>- decay in storage</li> <li>- disposal at a licensed land disposal facility</li> <li>- disposal at a geologic repository.</li> </ul>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.130</b> <b>Release in Effluents</b></p> <p><b>IR.130.1.</b> Installations that dispose of licensed material by release in effluents must meet specific requirements (10 CFR 20.2001(a)(3)).</p>	<p>Verify that the installation releases licensed material in effluents within the limits specified in 10 CFR 20.1301 (see the checklist items in IR.30).</p>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.140</b>  <b>Release into Sanitary Sewerage</b></p> <p><b>IR.140.1.</b> Installations that dispose of licensed material by release into sanitary sewerage must meet specific requirements (10 CFR 20.2003(a)(1) and (a)(2)).</p> <p><b>IR.140.2.</b> Installations that release more than one radionuclide must satisfy specific conditions (10 CFR 20.2003 (a)(3)).</p> <p><b>IR.140.3.</b> The total quantity of licensed and radioactive material released into sanitary sewerage must not exceed certain limits (10 CFR 20.2003(a)(4) and 20.2003(b)).</p>	<p>(NOTE: Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in the above sections.)</p> <p>Verify that the licensed material to be disposed of is readily soluble in water or is readily dispersible biological material.</p> <p>Verify that the quantity of licensed or other radioactive material that the installation releases into the sewer in 1 mo divided by the average monthly volume of water released into the sewer by the installation does not exceed the concentration listed in column 3 of Appendix B to 10 CFR 20.</p> <p>Determine whether the installation is discharging more than one radionuclide into sanitary sewerage.</p> <p>Verify that the installation divides the actual monthly average concentration of each radionuclide released by the installation into the sewer by the concentration of that radionuclide listed in column 3 of Appendix B to 10 CFR 20.</p> <p>Verify that the sum of the fractions for each radionuclide does not exceed unity.</p> <p>Verify that the total quantity of licensed and radioactive material that the installation releases into the sanitary sewerage in a year does not exceed:</p> <ul style="list-style-type: none"> <li>- 5 Ci (185 GBq) of hydrogen-3</li> <li>- 1 Ci (37 GBq) of carbon-14</li> <li>- 1 Ci (37 GBq) of all other radioactive material combined.</li> </ul>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.150</b> <b>Incineration</b></p> <p><b>IR.150.1.</b> Installations that dispose of licensed material by incineration must meet specific requirements (10 CFR 20.2004(a) and (b)(1)).</p> <p><b>IR.150.2.</b> Installations must report any changes or additions to previously reported incineration data (10 CFR 20.2004(b)(1)).</p> <p><b>IR.150.3.</b> Solid residues produced from incineration must be disposed of by specified procedures (10 CFR 20.2004(b)(2) and (b)(3)).</p>	<p>Verify that the installation treats or disposes of licensed material by incineration only:</p> <ul style="list-style-type: none"> <li>- if the material is in a form and concentration specified in 10 CFR 20.2005(a) (see checklist item IR.160.1)</li> <li>- as specifically approved by the Commission pursuant to the application process described above</li> <li>- as authorized below.</li> </ul> <p>(NOTE: Waste oils that have been radioactively contaminated in the course of the operation of a licensed nuclear power reactor may be incinerated on the site where generated provided that the total radioactive effluents from the facility, including the effluents from such incineration, conform to both:</p> <ul style="list-style-type: none"> <li>- the requirements of Appendix 1 to 10 CFR 50</li> <li>- the effluent release limits contained in applicable license conditions other than effluent limits specifically related to incineration of waste oil.)</li> </ul> <p>Determine whether there are any changes or additions to the information supplied by the installation under the procedures for reporting incineration data.</p> <p>Verify that the installation reports any changes or additions determined above, as appropriate.</p> <p>Verify that solid residues produced in the process of incinerating waste oils are disposed of as provided by 10 CFR 20.2001 (see the checklist items in IR.120).</p> <p>(NOTE: The provisions of 10 CFR 20.2004 authorize onsite waste oil incineration under the terms of this section and supersede any provision in an individual plant license or technical specification that may be inconsistent.)</p>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.160</b> <b>Disposal of Specific Wastes</b></p> <p><b>IR.160.1.</b> Licensed material must meet specific criteria in order for it to be disposed of as if it were not radioactive (10 CFR 20.2005(a)).</p> <p><b>IR.160.2.</b> Installations must take certain precautions when disposing of animal tissue (10 CFR 20.2005(b)).</p> <p><b>IR.160.3.</b> Installations must maintain proper records on the disposal of this type of material (10 CFR 20.2005(c)).</p>	<p>Verify that the licensed material contains:</p> <ul style="list-style-type: none"> <li>- 0.05 <math>\mu\text{Ci}</math> (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting</li> <li>- 0.05 <math>\mu\text{Ci}</math> (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal.</li> </ul> <p>Verify that the animal tissue does not exceed the radiation limits listed above.</p> <p>Verify that the installation does not dispose of animal tissue in a manner that would permit its use either as food for humans or as animal feed.</p> <p>Verify that the installation maintains records in accordance with the requirements of 10 CFR 20.2108 (see checklist item IR.180.18) for licensed material that is disposed of as if it were not radioactive and for disposed animal tissue.</p>



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<p><b>WASTE DISPOSAL</b></p> <p><b>IR.170</b>  <b>Transfer for Disposal and Manifests</b></p> <p><b>IR.170.1.</b> A shipment manifest must accompany each shipment of radio-active waste intended for disposal at a licensed land disposal facility (10 CFR 20.2006(b)).</p> <p><b>IR.170.2.</b> Each shipment manifest must include a certification by the waste generator (10 CFR 20.2006(c)).</p> <p><b>IR.170.3.</b> Persons involved in the transfer for disposal and disposal of waste must comply with specific requirements (10 CFR 20.2006(d)).</p>	<p>(NOTE: Prior to 1 March 1998, a low-level waste (LLW) disposal facility operator or its regulatory authority may require the shipper to use Addendum 19-2 or Addendum 19-3. Beginning 1 March 1998, all affected installations must use Addendum 19-3.)</p> <p>Verify that each shipment of radioactive waste intended for disposal at a licensed land disposal facility is accompanied by a shipment manifest that in accordance with section I of Addendum 19-2.</p> <p>(NOTE: This requirement applies only to installations that use Addendum 19-2.)</p> <p>Verify that any installation shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility documents the information required on the NRC's Uniform Low-Level Radioactive Waste Manifest.</p> <p>Verify that any installation shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility transfers this recorded manifest information to the intended consignee in accordance with Addendum 19-3.</p> <p>(NOTE: The above two requirements apply only to installations using Addendum 19-3.)</p> <p>Verify that each shipment manifest includes a certification by the waste generator in accordance with section II of Addendum 19-2 or Addendum 19-3, as appropriate.</p> <p>(NOTE: See the note to the heading for this section to determine appropriateness.)</p> <p>Verify that each person involved in the transfer for disposal and disposal of waste complies with the requirements specified in section III of Addendum 19-2 or Addendum 19-3, as appropriate.</p> <p>(NOTE: See the note to the heading for this section to determine appropriateness.)</p> <p>(NOTE: This requirement applies to:</p> <ul style="list-style-type: none"> <li>- the waste generator</li> <li>- the waste collector</li> <li>- the waste processor</li> <li>- the disposal facility operator.)</li> </ul>



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<p><b>IR.180 RECORDS</b></p> <p><b>IR.180.1.</b> Installations must use specified units on all required records (10 CFR 20.2101(a) and (b)).</p> <p><b>IR.180.2.</b> Installations must make a clear distinction among the quantities entered on required records (10 CFR 20.2101(c)).</p> <p><b>IR.180.3.</b> Installations must maintain records on the radiation protection program (10 CFR 20.2102(a)).</p> <p><b>IR.180.4.</b> Installations must retain records on the radiation protection program for specified lengths of time (10 CFR 20.2102(b)).</p> <p><b>IR.180.5.</b> Installations must maintain and retain survey and calibration records (10 CFR 20.2103(a)).</p>	<p>Verify that the installation uses the following units, including multiples and subdivisions, in its records:</p> <ul style="list-style-type: none"> <li>- Ci</li> <li>- rad</li> <li>- rem.</li> </ul> <p>Verify that the installation clearly indicates the units of all quantities on required records.</p> <p>Verify that, when recording information on shipment manifests as required in 10 CFR 20.2006(b) (see checklist item IR.170.1), the information is recorded either in the International System of Units (SI) or in SI and the units specified above.</p> <p>Verify that the installation makes a clear distinction among the quantities entered on required records.</p> <p>(NOTE: The following, for example, must be distinguished:</p> <ul style="list-style-type: none"> <li>- total effective dose equivalent</li> <li>- shallow-dose equivalent</li> <li>- eye dose equivalent</li> <li>- deep-dose equivalent</li> <li>- committed effective dose equivalent.)</li> </ul> <p>Verify that the installation maintains records on the radiation protection program that include:</p> <ul style="list-style-type: none"> <li>- the provisions of the program</li> <li>- audits and other reviews of program content and implementation.</li> </ul> <p>Verify that the installation retains records on the radiation protection program that contain the provisions of the program until the Commission terminates each pertinent license requiring the record.</p> <p>Verify that the installation retains records of the radiation program that contain audits and other reviews of program content and implementation for 3 yr.</p> <p>Verify that the installation maintains records showing the results of surveys and calibrations required by 10 CFR 20.1501 and 20.1906(b) (see checklist items IR.50.2 through IR.50.4, IR.110.2, and IR.110.3).</p>

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<b>IR.180.6.</b> Installations must retain certain records for periods of time set by the Commission (10 CFR 20.2103(b)).	Verify that the installation retains these records for 3 yr after the record is made.  Verify that, until the Commission terminates each pertinent license, the installation retains: <ul style="list-style-type: none"> <li>- records of the results of surveys to determine the dose from external sources and used, in the absence of or in combination with individual monitoring data, in the assessment of internal dose, including those records of results of surveys to determine the dose from external sources and used, in the assessment of individual dose equivalents required under the standards for protection against radiation in effect prior to 1 January 1994</li> <li>- records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose, including those records of results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose required under the standards for protection against radiation in effect prior to 1 January 1994</li> <li>- records showing the results of air sampling, surveys, and bioassays required pursuant to 10 CFR 20.1703(a)(3) (see checklist item IR.70.4), including those records showing the results of air sampling, surveys, and bioassays required under the standards for protection against radiation in effect prior to 1 January 1994</li> <li>- records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment, including those records of results of measurements and calculations used to evaluate the release of radio-active effluents to the environment required under the standards for protection against radiation in effect prior to 1 January 1994.</li> </ul>
	Determine whether any individual is likely to receive, in a year, an occupational dose requiring monitoring pursuant to 10 CFR 20.1502 (see checklist items IR.50.5 and IR.50.6).  Verify that, for each such individual, the installation: <ul style="list-style-type: none"> <li>- determines the occupational radiation dose received during the current year</li> <li>- attempts to obtain the records of cumulative occupational radiation dose.</li> </ul> (NOTE: In complying with these requirements, the installation may: <ul style="list-style-type: none"> <li>- accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and amount of any occupational dose that the individual may have received during the current year</li> <li>- accept, as the record of cumulative radiation dose, an up-to-date NRC Form 4, or equivalent, signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer (if the individual is not em-</li> </ul>

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<p><b>IR.180.8.</b> Installations must determine specific information prior to permitting an individual to participate in a planned special exposure (10 CFR 20.2104(b)).</p> <p><b>IR.180.9.</b> Installations must record the exposure history of certain individuals in accordance with certain procedures (10 CFR 20.2104(d)).</p> <p><b>IR.180.10.</b> Installations must make certain assumptions in the event that a complete record of an individual's current and previously accumulated dose is not available (10 CFR 20.2104(e)).</p>	<p>ployed by the installation)</p> <ul style="list-style-type: none"> <li>- obtain reports of the individual's doses equivalent(s) from the most recent employer for work involving radiation exposure, or the individual's current employer (if the individual is not employed by the installation) by telephone, telegram, electronic media, or letter. The installation must request a written verification of the dose data if the authenticity of the transmitted report cannot be established.)</li> </ul> <p>Verify that, prior to permitting an individual to participate in a planned special exposure, the installation determines:</p> <ul style="list-style-type: none"> <li>- the internal and external doses from all previous planned special exposures</li> <li>- all doses in excess of the limits (including doses received during accidents and emergencies) received during the lifetime of the individual.</li> </ul> <p>Determine whether an individual warrants the recording of exposure history pursuant to 10 CFR 20.2104(a) (see checklist item IR.180.7).</p> <p>Verify that the exposure history of the individual is recorded on NRC Form 4, or on another clean and legible record that includes all of the information required by NRC Form 4.</p> <p>(NOTE: Installations are not required to partition historical dose between external dose equivalent(s) and internal committed dose equivalent(s). Further, occupational exposure histories obtained and recorded on NRC Form 4 before 1 January 1994, might not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.)</p> <p>Verify that the form or record shows each period in which the individual received occupational exposure to radiation or radioactive material and is signed by the individual who received the exposure.</p> <p>(NOTE: For each period for which reports are received, the installation must use the dose shown in the report in preparing the NRC Form 4. For any period in which the report is missing, the installation must place a notation on the NRC Form 4 indicating the periods of time for which data are not available.)</p> <p>Verify that, in the absence of a complete record of an individual's current and previously accumulated dose, the installation assumes:</p> <ul style="list-style-type: none"> <li>- in establishing administrative controls under 10 CFR 20.1201(f) (see section I.5 of Addendum 19-1) for the current year, that the allowable dose limit for the individual is reduced by 1.25 rems (12.5 mSv) for each quarter for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure</li> <li>- that the individual is not available for planned special exposures.</li> </ul>

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<b>IR.180.11.</b> Installations must retain the records on NRC Form 4 or equivalent for a specified period of time (10 CFR 20.2104(f)).	<p>Verify that the installation retains the records on NRC Form 4 or equivalent until the Commission terminates each pertinent license requiring this record.</p> <p>Verify that the installation retains records used in preparing NRC Form 4 for 3 yr after the record is made.</p> <p>(NOTE: Records required under the standards for protection against radiation in effect prior to 1 January 1994 are included in this requirement.)</p>
<b>IR.180.12.</b> Installations must maintain records that describe specific features of a planned special exposure (10 CFR 20.2105(a)).	<p>Verify that, for each planned special exposure, the installation maintains records that describe:</p> <ul style="list-style-type: none"> <li>- the exceptional circumstances requiring the use of a planned special exposure</li> <li>- the name of the management official who authorized the planned special exposure and a copy of the signed authorization</li> <li>- what actions were necessary</li> <li>- why the actions were necessary</li> <li>- how doses were maintained ALARA</li> <li>- what individual and collective doses were expected to result, and the doses actually received in the planned special exposure.</li> </ul>
<b>IR.180.13.</b> Installations must retain records of planned special exposures for a specified period of time (10 CFR 20.2105(b)).	<p>Verify that the installation retains the required records of a planned special exposure until the Commission terminates each pertinent license requiring these records.</p>
<b>IR.180.14.</b> Installations must maintain records of doses received by individuals under specific circumstances (10 CFR 20.2106(a) through (d)).	<p>Verify that the installation maintains records of doses received by all individuals for whom monitoring is required pursuant to 10 CFR 20.1502 (see checklist items IR.50.5 and IR.50.6).</p> <p>Verify that the installation maintains records of doses received during planned special exposures, accidents, and emergency conditions.</p> <p>Verify that the records include:</p> <ul style="list-style-type: none"> <li>- the deep-dose equivalent to the whole body, eye dose equivalent, shallow-dose equivalent to the skin, and shallow-dose equivalent to the extremities</li> <li>- the estimated intake or body burden of radionuclides according to section V of Addendum 19-1</li> <li>- the committed effective dose equivalent assigned to the intake or body burden of radionuclides</li> <li>- the specific information used to calculate the committed effective dose equivalent pursuant to section IV of Addendum 19-1</li> <li>- the total effective dose equivalent when required by section V of Addendum 19-1</li> </ul>

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<p><b>IR.180.15.</b> Installations must maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman (10 CFR 20.2106(e)).</p> <p><b>IR.180.16.</b> Installations must maintain each required form until the termination of each pertinent license (10 CFR 20.2106(f)).</p> <p><b>IR.180.17.</b> Installations must maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public and must retain them for a specified period of time (10 CFR 20.2107).</p> <p><b>IR.180.18.</b> Installations must maintain records of the disposal of licensed material (10 CFR 20.2108).</p>	<p>- the total of the deep-dose equivalent and the committed dose to the organ receiving the highest total dose.</p> <p>(NOTE: Assessments of dose equivalent and records made using units in effect before the installation's adoption of this part need not be changed.)</p> <p>Verify that the installation makes entries of the records at least annually.</p> <p>Verify that the installation maintains the above records on NRC Form 5, in accordance with the instructions for NRC Form 5, or in clear and legible records containing all the information required by NRC Form 5.</p> <p>Verify that the installation protects the above records from public disclosure.</p> <p>(NOTE: These records are protected by most State privacy laws and, when transferred to the NRC, are protected by the <i>Privacy Act</i> of 1974, PL 93-579, 5 USC 552a, and the Commission's regulations in 10 CFR 9.)</p> <p>Verify that the installation maintains the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman.</p> <p>Verify that the declaration of pregnancy is also kept on file, although it may be maintained separately from the dose records.</p> <p>Verify that the installation retains each required form or record until the Commission terminates each pertinent license requiring the record.</p> <p>(NOTE: Records required under the standards for protection against radiation in effect prior to 1 January 1994 are included in this requirement.)</p> <p>Verify that the installation maintains records sufficient to demonstrate compliance with the dose limit for individuals of the public.</p> <p>Verify that the installation retains the above records until the Commission terminates each pertinent license requiring the record.</p> <p>Verify that the installation maintains records of the disposal of licensed materials made under 10 CFR 20.2002, 20.2003, 20.2004, 20.2005 (see checklist items IR.120.1 and the checklist items in IR.140, IR.150, and IR.160), 10 CFR 61, and disposal by burial in soil, including burials authorized before 28 January 1981.</p>

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<b>IR.180.19.</b> Records must be maintained in accordance with specific requirements (10 CFR 2110).	<p>(NOTE: A previous 10 CFR 20.304 permitted burial of small quantities of licensed materials in soil before 28 January 1981, without specific Commission authorization.)</p> <p>Verify that the installation retains the above records until the Commission terminates each pertinent license requiring the record.</p> <p>(NOTE: Requirements for disposition of these records, prior to license termination, are located in 10 CFR 30.51, 40.61, 70.51, and 72.80.)</p> <p>Verify that all records required above are legible throughout the specified retention period.</p> <p>Verify that records, such as letters, drawings, and specifications, include all pertinent information, such as stamps, initials, and signatures.</p> <p>Verify that the installation maintains adequate safeguards against tampering with and loss of records.</p> <p>(NOTE: The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability of producing legible, accurate, and complete records during the required retention period.)</p>

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<p><b>REPORTS</b></p> <p><b>IR.190</b>  <b>Theft or Loss of Licensed Material</b></p> <p><b>IR.190.1.</b> Installations must report theft or loss of licensed material by telephone under certain circumstances (10 CFR 20.2201 (a)(1)).</p> <p><b>IR.190.2.</b> Installations must follow specific guidelines when making a telephone report (10 CFR 20.2201 (a)(2)).</p> <p><b>IR.190.3.</b> Installations must file a subsequent written report setting forth specific information (10 CFR 20.2201(b)(1)).</p>	<p>(NOTE: Required reports are made to the Administration of the appropriate NRC Regional Office listed in Appendix 19-5.)</p> <p>Verify that the installation makes a report by telephone:</p> <ul style="list-style-type: none"> <li>- immediately after its occurrence becomes known to the installation, any lost, stolen, or missing licensed material in an aggregate quantity greater than 1000 times the quantity specified in Appendix 19-6 under such circumstances that it appears to the installation that an exposure could result to persons in unrestricted areas</li> <li>- within 30 days after the occurrence of any lost, stolen, or missing licensed material becomes known to the installation, all licensed material in a quantity greater than 10 times the quantity specified in Appendix 19-6 that is still missing at this time.</li> </ul> <p>Determine whether the installation has an installed Emergency Notification System.</p> <p>Verify that the installation makes reports to the NRC Operations Center in accordance with 10 CFR 50.72.</p> <p>Verify that all other installations make reports by telephone to the NRC Operations Center (301-816-5100).</p> <p>Determine whether the installation is required to make a report under 10 CFR 20.2201(a) (see checklist items IR.190.1 and IR.190.2).</p> <p>Verify that, within 30 days after making a telephone report, the installation makes a written report that contains:</p> <ul style="list-style-type: none"> <li>- a description of the licensed material involved, including kind, quantity, and chemical and physical form</li> <li>- a description of the circumstances under which the loss or theft occurred</li> <li>- a statement of disposition, or probable disposition, of the licensed material involved</li> <li>- exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas</li> <li>- actions that have been taken, or will be taken, to recover the material</li> <li>- procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed material.</li> <li>- actions that have been taken, or will be taken, to recover the material</li> </ul>

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<p><b>IR.190.4.</b> Installations must report additional information subsequent to filing a written report (10 CFR 20.2201(d)).</p> <p><b>IR.190.5.</b> Installations must emphasize the names of irradiated individuals in written reports (10 CFR 20.2201(e)).</p>	<p>- procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed material.</p> <p>Verify that, subsequent to filing a written report, the installation reports any additional substantive information on the loss or theft within 30 days after learning of such information.</p> <p>Verify that reports are prepared so that the names of individuals who may have received exposure to radiation are stated in a separate and detachable part of the report.</p>

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<p><b>REPORTS</b></p> <p><b>IR.200</b> <b>Notification of Incidents</b></p> <p><b>IR.200.1.</b> Installations must immediately report events that involve excessive radiation exposure to individuals (10 CFR 20.2202(a)(1)).</p> <p><b>IR.200.2.</b> Installations must immediately report events that involve the release of excessive amounts of radioactive material (10 CFR 20.2202(a)(2)).</p> <p><b>IR.200.3.</b> Installations must report, within 24 h, events that involve excessive radiation exposure to individuals (10 CFR 20.2202(b)(1)).</p> <p><b>IR.200.4.</b> Installations must report, within 24 h, events that involve the release of excessive radioactive material (10 CFR 20.2202(b)(2)).</p> <p><b>IR.200.5.</b> Installations must emphasize the names of irradiated individuals in reports (10 CFR 20.2202(c)).</p>	<p>Verify that, notwithstanding any other requirements for notification, the installation immediately reports any event that causes or threatens to cause an individual to receive one of the following:</p> <ul style="list-style-type: none"> <li>- a total effective dose equivalent of 25 rems (0.25 Sv) or more</li> <li>- an eye dose equivalent of 75 rems (0.75 Sv) or more</li> <li>- a shallow-dose equivalent to the skin or extremities of 250 rads (2.5 Gy) or more.</li> </ul> <p>Verify that, notwithstanding any other requirements for notification, the installation immediately reports any event that causes or threatens to cause the release of radio-active material, inside or outside of a restricted area, so that, had an individual been present for 24 h, the individual could have received an intake five times the annual limit on intake.</p> <p>(NOTE: This requirement does not apply to locations where personnel are stationed during routine operations, such as hot-cells or process enclosures.)</p> <p>Verify that the installation reports, within 24 h, any event that causes or threatens to cause an individual to receive, in a period of 24 h, one of the following:</p> <ul style="list-style-type: none"> <li>- a total effective dose equivalent exceeding 5 rems (0.05 Sv)</li> <li>- an eye dose equivalent exceeding 15 rems (0.15 Sv)</li> <li>- a shallow-dose equivalent to the skin or extremities exceeding 50 rems (0.5 Sv).</li> </ul> <p>Verify that the installation reports, within 24 h, any event that causes or threatens to cause the release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 h, the individual could have received an intake in excess of one occupational annual limit on intake.</p> <p>(NOTE: The provisions of this checklist item do not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.)</p> <p>Verify that reports are prepared so that names of individuals who have received exposure to radiation or radioactive material are stated in a separate and detachable part of the report.</p>

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<p><b>IR.200.6.</b> Installations must make required reports in accordance with specific procedures (10 CFR 20.2202(d) and (e)).</p>	<p>Determine whether the installation has an installed Emergency Notification System.</p> <p>Verify that the installation makes reports required by 10 CFR 20.2202(a) and 20.2202(b) (see checklist items IR.200.1 through IR.200.4) to the NRC Operations Center.</p> <p>Verify that installations that do not have installed Emergency Notification Systems make the reports required under 10 CFR 20.2202(a) and 20.2202(b) (see checklist items IR.200.1 through IR.200.4) by telephone to the NRC Operations Center (301-816-5100) and by telegram, mailgram, or facsimile to the Administrator of the appropriate NRC Regional Office listed in Appendix 19-5.</p> <p>(NOTE: The provisions of this section do not include doses that result from planned special exposures, that are within the limits for planned special exposures, and that are reported under 10 CFR 20.2204 (see checklist item IR.200.12).)</p>
<p><b>IR.200.7.</b> Installations must submit a written report within 30 days after learning of excessive dose limits (10 CFR 20.2203(a)(1) and (a)(2)).</p>	<p>Verify that the installation submits a written report within 30 days after learning of:</p> <ul style="list-style-type: none"> <li>- any incident for which notification is required by 10 CFR 20.2202 (see checklist items IR.200.1 through IR.200.6)</li> <li>- doses in excess of any of the following: <ul style="list-style-type: none"> <li>- the occupational dose limits for adults in 10 CFR 20.1201 (see checklist items IR.20.1 and IR.20.3)</li> <li>- the limits for an embryo/fetus of a declared pregnant woman in 10 CFR 20.1208 (see checklist item IR.20.2)</li> <li>- the limits for an individual member of the public in 10 CFR 20.1301 (see the checklist items in IR.30)</li> <li>- any applicable limit in the license</li> </ul> </li> <li>- the ALARA constraints for air emissions established under 10 CFR 20.1101(d) (see checklist item IR.10.1).</li> </ul>
<p><b>IR.200.8.</b> Installations must submit a written report within 30 days after learning of excessive radiation exposure (10 CFR 20.2203(a)(3)).</p>	<p>Verify that the installation submits a written report within 30 days after learning of levels of radiation or concentrations of radioactive material in:</p> <ul style="list-style-type: none"> <li>- a restricted area in excess of any applicable limit in the license</li> <li>- an unrestricted area in excess of 10 times any applicable limit set forth in this part or in the license (whether or not involving exposure of any individual in excess of the limits in 10 CFR 20.1301 (see the checklist items in IR.30).</li> </ul>

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<p><b>IR.200.9.</b> Installations must submit a written report within 30 days after learning of excessive radiation exposure (10 CFR 20.2203(a)(3)).</p> <p><b>IR.200.10.</b> Reports must describe the extent of exposure to individuals to radiation and radioactive material (10 CFR 20.2203(b)(1)).</p> <p><b>IR.200.11.</b> Reports must include personal identification of exposed individuals (10 CFR 20.2203(b)(2) through (d)).</p> <p><b>IR.200.12.</b> Installations must notify appropriate authorities within 30 days following a planned special exposure (10 CFR 20.2204).</p>	<p>Determine whether the installation is subject to the provisions of the USEPA's generally applicable environmental radiation standards in 40 CFR 190.</p> <p>Verify that levels of radiation or releases of radioactive material in excess of those standards, or of license conditions related to those standards, are reported.</p> <p>Verify that the report required by 10 CFR 20.2203(a) (see checklist items IR.200.7 through IR.200.9) describes the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:</p> <ul style="list-style-type: none"> <li>- estimates of each individual's dose</li> <li>- the levels of radiation and concentrations of radioactive material involved</li> <li>- the cause of the elevated exposures, dose rates, or concentrations</li> <li>- corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, ALARA constraints, generally applicable environmental standards, and associated license conditions.</li> </ul> <p>Verify that the report includes for each occupationally overexposed individual:</p> <ul style="list-style-type: none"> <li>- the name</li> <li>- Social Security number</li> <li>- date of birth.</li> </ul> <p>(NOTE: With respect to the limit for the embryo/fetus, the identifiers should be those of the declared pregnant woman.)</p> <p>Verify that the report is prepared so that the personal identification is stated in a separate and detachable part of the report.</p> <p>(NOTE: All installations, other than those holding an operating license for a nuclear power plant, who make reports under 10 CFR 20.2203(a) (see checklist items IR.200.7 through IR.200.9) must submit the report in writing to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC 20555, with a copy to the appropriate NRC Regional Office listed in Appendix 19-5.)</p> <p>Verify that the installation submits a written report to the Administrator of the appropriate NRC Regional Office within 30 days following any planned special exposure.</p> <p>Verify that the report informs the Commission that a planned special exposure was conducted and indicates the date the planned special exposure occurred and the information required by 10 CFR 20.2105 (see checklist item IR.180.12).</p>

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<p><b>IR.200.13.</b> When the installation is required to report to the Commission any exposure of an identified individual, or an identified member of the public, to radiation or radioactive material, the installation must also provide a copy of the report submitted to the Commission to the individual (10 CFR 20.2205).</p> <p><b>IR.200.14.</b> Installations must submit an annual report under certain conditions (10 CFR 20.2206(a) and (b)).</p>	<p>Determine whether the installation has been required to report to the Commission any exposure of an identified individual, or an identified member of the public, to radiation or radioactive material.</p> <p>Verify that the installation provided a copy of the report submitted to the Commission to the individual.</p> <p>Verify that the report was transmitted at a time no later than the transmittal to the Commission.</p> <p>Determine whether the installation is licensed by the Commission to:</p> <ul style="list-style-type: none"> <li>- operate a nuclear reactor designed to produce electrical or heat energy pursuant to 10 CFR 50.21(b) or 50.22 or a testing facility as defined in 10 CFR 50.2</li> <li>- possess or use at any one time, for purposes of fuel processing, fabricating, or reprocessing, special nuclear material in a quantity exceeding 5000 grams of contained uranium-235, uranium-233, or plutonium, or any combination thereof pursuant to 10 CFR 20.70</li> <li>- possess high-level radioactive waste at a geologic repository operations area pursuant to 10 CFR 60</li> <li>- possess spent fuel in an independent spent fuel storage installation (ISFSI) pursuant to 10 CFR 72</li> <li>- receive radioactive waste from other persons for disposal under 10 CFR 61</li> <li>- possess or use at any time, for processing or manufacturing for distribution pursuant to 10 CFR 30, 32, 33, or 35, by-product material in quantities exceeding any one of the quantities found in Appendix 19-8.</li> </ul> <p>Verify that the installation submits an annual report of the results of individual monitoring carried out by the installation for each individual for whom monitoring was specifically required by 10 CFR 20.1502 (see checklist items IR.50.5 and IR.50.6).</p> <p>(NOTE: The installation may include additional data for individuals for whom monitoring was provided but not provided.)</p> <p>Verify that the installation, in submitting an annual report, uses Form NRC 5 or the electronic media containing all the information required by Form NRC 5.</p>

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<b>IR.200.15.</b> Installations that must file annual reports must file them on or before a certain date (10 CFR 20.2206(c)).	<p>Determine whether the installation is required to file annual reports under 10 CFR 20.2206(a) and 20.2206(b) (see checklist item IR.200.14).</p> <p>Verify that the installation files its annual reports on or before 30 April of each year.</p> <p>Verify that the installation submits each annual report to the Radiation Exposure Information and Reporting System (REIRS) Project Manager, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555.</p>



## Appendix 19-1

### Quality Factors and Absorbed Dose Equivalencies (10 CFR 20.1004(b).1)

Type of Radiation	Quality Factor (Q)	Absorbed dose equal to a unit dose equivalent <sup>1</sup>
X-, gamma, or beta radiation	1	1
Alpha particles, multiple-charged particles, fission fragments and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

<sup>1</sup> Absorbed dose in rad equal to 1 rem of the absorbed dose in gray equal to 1 Sv.



# Appendix 19-2

## Mean Quality Factors, Q, and Fluence Per Unit Dose Equivalent for Monoenergetic Neutrons (10 CFR 20.1004(b).2)

	Neutron Energy (MeV)	Quality Factor <sup>a</sup>	Fluence per unit dose equivalent <sup>b</sup> (neutrons cm <sup>-2</sup> rem <sup>-1</sup> )
(thermal).....	$2.5 \times 10^{-8}$	2	$980 \times 10^6$
	$1 \times 10^{-7}$	2	$980 \times 10^6$
	$1 \times 10^{-6}$	2	$810 \times 10^6$
	$1 \times 10^{-5}$	2	$810 \times 10^6$
	$1 \times 10^{-4}$	2	$840 \times 10^6$
	$1 \times 10^{-3}$	2	$980 \times 10^6$
	$1 \times 10^{-2}$	2.5	$1010 \times 10^6$
	$1 \times 10^{-1}$	7.5	$170 \times 10^6$
	$5 \times 10^{-1}$	11	$39 \times 10^6$
	1	11	$27 \times 10^6$
	2.5	9	$29 \times 10^6$
	5	8	$23 \times 10^6$
	7	7	$24 \times 10^6$
	10	6.5	$24 \times 10^6$
	14	7.5	$17 \times 10^6$
	20	8	$16 \times 10^6$
	40	7	$14 \times 10^6$
	60	5.5	$16 \times 10^6$
	$1 \times 10^2$	4	$20 \times 10^6$
	$2 \times 10^2$	3.5	$19 \times 10^6$
	$3 \times 10^2$	3.5	$16 \times 10^6$
	$4 \times 10^2$	3.5	$14 \times 10^6$

<sup>a</sup> Value of quality factor (Q) at the point where the dose equivalent is maximum in a 30-cm [11.81-in.] diameter cylinder tissue-equivalent phantom.

<sup>b</sup> Monoenergetic neutrons incident normally on a 30-cm [11.81-in.] diameter cylinder tissue-equivalent phantom.



### Appendix 19-3

#### A1 and A2 Values for Radionuclides (10 CFR 71, Appendix A)

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{227}_{Ac}$	Actinium (89)	1000	0.003	$7.2 \times 10$
$^{228}_{Ac}$		10	4	$2.2 \times 10^6$
$^{105}_{Ag}$	Silver (47)	40	40	$3.1 \times 10^4$
$^{110m}_{Ag}$		7	7	$4.7 \times 10^3$
$^{111}_{Ag}$		100	20	$1.6 \times 10^5$
$^{241}_{Am}$	Americium (95)	8	0.008	3.2
$^{243}_{Am}$		8	0.008	$1.9 \times 10^{-1}$
$^{37}_{Ar}$ (compressed or uncompressed)*	Argon (18)	1000	1000	$1.0 \times 10^5$
$^{41}_{Ar}$ (uncompressed)*		20	20	$4.3 \times 10^7$
$^{41}_{Ar}$ (compressed)*		1	1	$4.3 \times 10^7$
$^{73}_{As}$	Arsenic (33)	1000	400	$2.4 \times 10^4$
$^{74}_{As}$		20	20	$1.0 \times 10^5$
$^{76}_{As}$		10	10	$1.6 \times 10^6$
$^{77}_{As}$		300	20	$1.1 \times 10^6$
$^{211}_{At}$	Astatine (85)	200	7	$2.1 \times 10^6$
$^{193}_{Au}$	Gold (79)	200	200	$9.3 \times 10^5$
$^{196}_{Au}$		30	30	$1.2 \times 10^5$
$^{198}_{Au}$		40	20	$2.5 \times 10^5$
$^{199}_{Au}$		200	25	$2.1 \times 10^5$
$^{131}_{Ba}$	Barium (56)	40	40	$8.7 \times 10^4$
$^{133}_{Ba}$		40	10	$4.0 \times 10^2$
$^{140}_{Ba}$		20	20	$7.3 \times 10^4$
$^7_{Be}$	Beryllium (4)	300	300	$3.5 \times 10^5$
$^{206}_{Bi}$	Bismuth (83)	5	5	$9.9 \times 10^4$
$^{207}_{Bi}$		10	25	$2.2 \times 10^2$
$^{210}_{Bi}$ (RaE)		100	4	$1.2 \times 10^5$
$^{212}_{Bi}$		6	6	$1.5 \times 10^7$
$^{249}_{Bk}$	Berkelium (97)	1000	1	$1.8 \times 10^3$
$^{77}_{Br}$	Bromine (35)	70	25	$7.1 \times 10^5$
$^{82}_{Br}$		6	6	$1.1 \times 10^6$
$^{11}_{C}$	Carbon (6)	20	20	$8.4 \times 10^8$
$^{14}_{C}$		1000	60	4.6
$^{45}_{Ca}$	Calcium (20)	1000	25	$1.9 \times 10^4$
$^{47}_{Ca}$		20	20	$5.9 \times 10^5$
$^{109}_{Cd}$	Cadmium (48)	1000	70	$2.6 \times 10^3$
$^{115m}_{Cd}$		30	30	$2.6 \times 10^4$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{115}_{\text{Cd}}$		80	20	$5.1 \times 10^5$
$^{139}_{\text{Ce}}$	Cerium	100	100	$6.5 \times 10^3$
$^{141}_{\text{Ce}}$		300	25	$2.8 \times 10^4$
$^{143}_{\text{Ce}}$		60	20	$6.6 \times 10^5$
$^{144}_{\text{Ce}}$		10	7	$3.2 \times 10^3$
$^{249}_{\text{Cf}}$	Californium (98)	2	0.002	3.1
$^{250}_{\text{Cf}}$		7	0.007	$1.3 \times 10^2$
$^{252}_{\text{Cf}}$		2	0.009	$6.5 \times 10^2$
$^{36}_{\text{Cl}}$	Chlorine (17)	300	10	$3.2 \times 10^{-2}$
$^{38}_{\text{Cl}}$		10	10	$1.3 \times 10^8$
$^{242}_{\text{Cm}}$	Curium (96)	200	0.2	$3.3 \times 10^3$
$^{243}_{\text{Cm}}$		9	0.009	$4.2 \times 10$
$^{244}_{\text{Cm}}$		10	0.01	$8.2 \times 10$
$^{245}_{\text{Cm}}$		6	0.006	$1.0 \times 10^{-1}$
$^{246}_{\text{Cm}}$		6	0.006	$3.6 \times 10^{-1}$
$^{56}_{\text{Co}}$	Cobalt (27)	5	5	$3.0 \times 10^4$
$^{57}_{\text{Co}}$		90	90	$8.5 \times 10^3$
$^{58\text{m}}_{\text{Co}}$		1000	1000	$5.9 \times 10^6$
$^{58}_{\text{Co}}$		20	20	$3.1 \times 10^4$
$^{60}_{\text{Co}}$		7	7	$1.1 \times 10^3$
$^{51}_{\text{Cr}}$	Chromium (24)	600	600	$9.2 \times 10^4$
$^{129}_{\text{Cs}}$	Cesium (55)	40	40	$7.6 \times 10^5$
$^{131}_{\text{Cs}}$		1000	1000	$1.0 \times 10^5$
$^{134\text{m}}_{\text{Cs}}$		1000	10	$7.4 \times 10^6$
$^{134}_{\text{Cs}}$		10	10	$1.2 \times 10^3$
$^{135}_{\text{Cs}}$		1000	25	$8.8 \times 10^{-4}$
$^{136}_{\text{Cs}}$		7	7	$7.4 \times 10^4$
$^{137}_{\text{Cs}}$		30	10	$9.8 \times 10$
$^{64}_{\text{Cu}}$	Copper (29)	80	25	$3.8 \times 10^6$
$^{67}_{\text{Cu}}$		200	25	$7.9 \times 10^5$
$^{165}_{\text{Dy}}$	Dysprosium (66)	100	20	$8.2 \times 10^8$
$^{166}_{\text{Dy}}$		1000	200	$2.3 \times 10^5$
$^{169}_{\text{Er}}$	Erbium (68)	1000	25	$8.2 \times 10^4$
$^{171}_{\text{Er}}$		50	20	$2.4 \times 10^6$
$^{152\text{m}}_{\text{Eu}}$	Europium (63)	30	30	$2.2 \times 10^6$
$^{152}_{\text{Eu}}$		20	10	$1.9 \times 10^2$
$^{154}_{\text{Eu}}$		10	5	$1.5 \times 10^2$
$^{155}_{\text{Eu}}$		400	60	$1.4 \times 10^3$
$^{18}_{\text{F}}$	Fluorine (9)	20	20	$9.3 \times 10^7$
$^{52}_{\text{Fe}}$	Iron (26)	5	5	$7.3 \times 10^6$
$^{55}_{\text{Fe}}$		1000	1000	$2.2 \times 10^3$
$^{59}_{\text{Fe}}$		10	10	$4.9 \times 10^4$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{67}_{\text{Ga}}$	Gallium (31)	100	100	$6.0 \times 10^5$
$^{68}_{\text{Ga}}$		20	20	$4.0 \times 10^7$
$^{72}_{\text{Ga}}$		7	7	$3.1 \times 10^6$
$^{153}_{\text{Gd}}$	Gadolinium (64)	200	100	$3.6 \times 10^3$
$^{159}_{\text{Gd}}$		300	20	$1.1 \times 10^6$
$^{68}_{\text{Ge}}$	Germanium (32)	20	10	$7.0 \times 10^3$
$^{71}_{\text{Ge}}$		1000	1000	$1.6 \times 10^5$
$^3_{\text{H}}$	Hydrogen (1) (see T- Tritium)			
$^{181}_{\text{Hf}}$	Hafnium (72)	30	25	$1.6 \times 10^4$
$^{197\text{m}}_{\text{Hg}}$	Mercury (80)	200	200	$2.5 \times 10^5$
$^{197}_{\text{Hg}}$		200	200	$2.5 \times 10^5$
$^{203}_{\text{Hg}}$		80	25	$1.4 \times 10^4$
$^{166}_{\text{Ho}}$	Holmium (67)	30	30	$6.9 \times 10^5$
$^{123}_{\text{I}}$	Iodine (53)	50	50	$1.9 \times 10^6$
$^{125}_{\text{I}}$		1000	70	$1.7 \times 10^4$
$^{126}_{\text{I}}$		40	10	$7.8 \times 10^4$
$^{129}_{\text{I}}$		1000	2	$1.6 \times 10^{-4}$
$^{131}_{\text{I}}$		40	10	$1.2 \times 10^5$
$^{132}_{\text{I}}$		7	7	$1.1 \times 10^7$
$^{133}_{\text{I}}$		30	10	$1.1 \times 10^6$
$^{134}_{\text{I}}$		8	8	$2.7 \times 10^7$
$^{135}_{\text{I}}$		10	10	$3.5 \times 10^6$
$^{111}_{\text{In}}$	Indium (49)	30	25	$4.2 \times 10^5$
$^{113\text{m}}_{\text{In}}$		60	60	$1.6 \times 10^7$
$^{114\text{m}}_{\text{In}}$		30	20	$2.3 \times 10^4$
$^{115\text{m}}_{\text{In}}$		100	20	$6.1 \times 10^6$
$^{190}_{\text{Ir}}$	Iridium (77)	10	10	$6.2 \times 10^4$
$^{192}_{\text{Ir}}$		20	10	$9.1 \times 10^3$
$^{194}_{\text{Ir}}$		10	10	$8.5 \times 10^5$
$^{42}_{\text{K}}$	Potassium (19)	10	10	$6.0 \times 10^6$
$^{43}_{\text{K}}$		20	10	$3.3 \times 10^6$
$^{85\text{m}}_{\text{Kr}}$ (uncompressed)*	Krypton (36)	100	100	$8.4 \times 10^6$
$^{85\text{m}}_{\text{Kr}}$ (compressed)*		3	3	$8.4 \times 10^6$
$^{85}_{\text{Kr}}$ (uncompressed)*		1000	1000	$4.0 \times 10^2$
$^{85}_{\text{Kr}}$ (compressed)*		5	5	$4.0 \times 10^2$
$^{87}_{\text{Kr}}$ (uncompressed)*		20	20	$2.8 \times 10^7$
$^{87}_{\text{Kr}}$ (compressed)*		0.6	0.6	$2.8 \times 10^7$
$^{140}_{\text{La}}$	Lanthanum (57)	30	30	$5.6 \times 10^5$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
LSA	Low specific activity material (Footnote!)			
$^{177}\text{Lu}$	Lutetium (71)	300	25	$1.1 \times 10^5$
MFP	Mixed fission products	10	0.4	
$^{28}\text{Mg}$	Magnesium (12)	6	6	$5.2 \times 10^6$
$^{52}\text{Mn}$	Manganese (25)	5	5	$4.4 \times 10^5$
$^{54}\text{Mn}$		20	20	$8.3 \times 10^3$
$^{56}\text{Mn}$		5	5	$2.2 \times 10^7$
$^{99}\text{Mo}$	Molybdenum (42)	100	20	$4.7 \times 10^5$
$^{13}\text{N}$	Nitrogen (7)	20	10	$1.5 \times 10^9$
$^{22}\text{Na}$	Sodium (11)	8	8	$6.3 \times 10^3$
$^{24}\text{Na}$		5	5	$8.7 \times 10^6$
$^{93\text{m}}\text{Nb}$	Niobium (41)	1000	200	$1.1 \times 10^3$
$^{95}\text{Nb}$		20	20	$3.9 \times 10^4$
$^{97}\text{Nb}$		20	20	$2.6 \times 10^7$
$^{147}\text{Nd}$	Neodymium (60)	100	20	$8.0 \times 10^4$
$^{149}\text{Nd}$		30	20	$1.1 \times 10^7$
$^{59}\text{Ni}$	Nickel (28)	1000	900	$8.1 \times 10^{-2}$
$^{63}\text{Ni}$		1000	100	$4.6 \times 10$
$^{65}\text{Ni}$		10	10	$1.9 \times 10^7$
$^{237}\text{Np}$	Neptunium (93)	5	0.005	$6.9 \times 10^{-4}$
$^{239}\text{Np}$		200	25	$2.3 \times 10^5$
$^{185}\text{Os}$	Osmium (76)	20	20	$7.3 \times 10^3$
$^{191}\text{Os}$		600	200	$4.6 \times 10^4$
$^{191\text{m}}\text{Os}$		200	200	$1.2 \times 10^6$
$^{193}\text{Os}$		100	20	$5.3 \times 10^5$
$^{32}\text{P}$	Phosphorus (15)	30	30	$2.9 \times 10^5$
$^{230}\text{Pa}$	Protactinium (91)	20	0.8	$3.2 \times 10^4$
$^{231}\text{Pa}$		2	0.002	$4.5 \times 10^{-2}$
$^{233}\text{Pa}$		100	100	$2.1 \times 10^4$
$^{201}\text{Pb}$	Lead (82)	20	20	$1.7 \times 10^6$
$^{210}\text{Pb}$		100	0.2	$8.8 \times 10$
$^{212}\text{Pb}$		6	5	$1.4 \times 10^6$
$^{103}\text{Pd}$	Palladium (46)	1000	700	$7.5 \times 10^4$
$^{109}\text{Pd}$		100	20	$2.1 \times 10^6$
$^{147}\text{Pm}$	Promethium (61)	1000	25	$9.4 \times 10^2$
$^{149}\text{Pm}$		100	20	$4.2 \times 10^5$
$^{210}\text{Po}$	Polonium (84)	200	0.2	$4.5 \times 10^3$
$^{142}\text{Pr}$	Praseodymium (59)	10	10	$1.2 \times 10^4$
$^{143}\text{Pr}$		300	20	$6.6 \times 10^4$
$^{191}\text{Pt}$	Platinum (78)	100	100	$2.3 \times 10^5$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{193m}\text{Pt}$		200	200	$2.0 \times 10^5$
$^{197m}\text{Pt}$		300	20	$1.2 \times 10^7$
$^{197}\text{Pt}$		300	20	$8.8 \times 10^5$
$^{238}\text{Pu}$	Plutonium (94)	3	0.003	$1.7 \times 10$
$^{239}\text{Pu}$		2	0.002	$6.2 \times 10^{-2}$
$^{240}\text{Pu}$		2	0.002	$2.3 \times 10^{-1}$
$^{241}\text{Pu}$		1000	0.1	$1.1 \times 10^{-2}$
$^{242}\text{Pu}$		3	0.003	$3.9 \times 10^{-3}$
$^{223}\text{Ra}$	Radium (88)	50	0.2	$5.0 \times 10^4$
$^{224}\text{Ra}$		6	0.5	$1.6 \times 10^5$
$^{226}\text{Ra}$		10	0.05	1.0
$^{228}\text{Ra}$		10	0.05	$2.3 \times 10^{-2}$
$^{81}\text{Rb}$	Rubidium (37)	30	25	$8.2 \times 10^6$
$^{86}\text{Rb}$		30	30	$8.1 \times 10^4$
$^{87}\text{Rb}$		Unlimited	Unlimited	$6.6 \times 10^{-8}$
$\text{Rb (natural)}$		Unlimited	Unlimited	$1.8 \times 10^{-8}$
$^{186}\text{Re}$	Rhenium (75)	100	20	$1.9 \times 10^5$
$^{187}\text{Re}$		Unlimited	Unlimited	$3.8 \times 10^{-8}$
$^{188}\text{Re}$		10	10	$1.0 \times 10^6$
$\text{Re (natural)}$		Unlimited	Unlimited	$2.4 \times 10^{-8}$
$^{103m}\text{Rh}$	Rhodium (45)	1000	1000	$3.2 \times 10^7$
$^{105}\text{Rh}$		200	25	$8.2 \times 10^5$
$^{222}\text{Rn}$	Radon (86)	10	2	$1.5 \times 10^5$
$^{97}\text{Ru}$	Ruthenium (44)	80	80	$5.5 \times 10^5$
$^{103}\text{Ru}$		30	25	$3.2 \times 10^4$
$^{105}\text{Ru}$		20	20	$6.6 \times 10^6$
$^{106}\text{Ru}$		10	7	$3.4 \times 10^3$
$^{35}\text{S}$	Sulphur (16)	1000	60	$4.3 \times 10^4$
$^{122}\text{Sb}$	Antimony (51)	30	30	$3.9 \times 10^5$
$^{124}\text{Sb}$		5	5	$1.8 \times 10^4$
$^{125}\text{Sb}$		40	25	$1.4 \times 10^3$
$^{46}\text{Sc}$	Scandium (21)	8	8	$3.4 \times 10^4$
$^{47}\text{Sc}$		200	20	$8.2 \times 10^5$
$^{48}\text{Sc}$		5	5	$1.5 \times 10^6$
$^{75}\text{Se}$	Selenium (34)	40	40	$1.4 \times 10^4$
$^{31}\text{Si}$	Silicon (14)	100	20	$3.9 \times 10^7$
$^{147}\text{Sm}$	Samarium (62)	Unlimited	Unlimited	$2.0 \times 10^{-8}$
$^{151}\text{Sm}$		1000	90	$2.6 \times 10$
$^{153}\text{Sm}$		300	20	$4.4 \times 10^5$
$^{113}\text{Sn}$	Tin (50)	60	60	$1.0 \times 10^4$
$^{119m}\text{Sn}$		100	100	$4.4 \times 10^3$
$^{125}\text{Sn}$		10	10	$1.1 \times 10^5$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$85m_{Sr}$	Strontium (38)	80	80	$3.2 \times 10^7$
$85_{Sr}$		30	30	$2.4 \times 10^4$
$87m_{Sr}$		50	50	$1.2 \times 10^7$
$89_{Sr}$		100	10	$2.9 \times 10^4$
$90_{Sr}$		10	0.4	$1.5 \times 10^2$
$91_{Sr}$		10	10	$3.6 \times 10^6$
$92_{Sr}$		10	10	$1.3 \times 10^7$
$T$ (uncompressed)*	Tritium (1)	1000	1000	$9.7 \times 10^3$
$T$ (compressed)*		1000	1000	$9.7 \times 10^3$
$T$ (activated luminous paint)		1000	1000	$9.7 \times 10^3$
$T$ (adsorbed on solid carrier)		1000	1000	$9.7 \times 10^3$
$T$ (tritiated water)		1000	1000	$9.7 \times 10^3$
$T$ (other forms)		20	20	$9.7 \times 10^3$
$182_{Ta}$	Tantalum (73)	20	20	$6.2 \times 10^3$
$160_{Tb}$	Terbium (65)	20	10	$1.1 \times 10^4$
$96m_{Tc}$	Technetium (43)	1000	1000	$3.8 \times 10^7$
$96_{Tc}$		6	6	$3.2 \times 10^5$
$97m_{Tc}$		1000	200	$1.5 \times 10^4$
$97_{Tc}$		1000	400	$1.4 \times 10^3$
$99m_{Tc}$		100	100	$5.2 \times 10^6$
$99_{Tc}$		1000	25	$1.7 \times 10^{-2}$
$125m_{Te}$	Tellurium (52)	1000	100	$1.8 \times 10^4$
$127M_{Te}$		300	20	$4.0 \times 10^4$
$127_{Te}$		300	20	$2.6 \times 10^6$
$129M_{Te}$		30	10	$2.5 \times 10^4$
$129_{Te}$		100	20	$2.0 \times 10^7$
$131m_{Te}$		10	10	$8.0 \times 10^5$
$132_{Te}$		7	7	$3.1 \times 10^5$
$227_{Th}$	Thorium (90)	200	0.2	$3.2 \times 10^4$
$228_{Th}$		6	0.008	$8.3 \times 10^2$
$230_{Th}$		3	0.003	$1.9 \times 10^{-2}$
$231_{Th}$		1000	25	$5.3 \times 10^5$
$232_{Th}$		Unlimited	Unlimited	$1.1 \times 10^{-7}$
$234_{Th}$		10	10	$2.3 \times 10^4$
$Th$ (natural)		Unlimited	Unlimited	$2.2 \times 10^{-7}$
$Th$ (irradiated)**				
$200_{Tl}$	Thallium (81)	20	20	$5.8 \times 10^5$
$201_{Tl}$		200	200	$2.2 \times 10^5$
$202_{Tl}$		40	40	$5.4 \times 10^4$
$204_{Tl}$		300	10	$4.3 \times 10^2$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{170}\text{Tm}$	Thulium (69)	300	10	$6.0 \times 10^3$
$^{171}\text{Tm}$		1000	100	$1.1 \times 10^3$
$^{230}\text{U}$	Uranium (92)	100	0.1	$2.7 \times 10^4$
$^{232}\text{U}$		30	0.03	$2.1 \times 10$
$^{233}\text{U}$		100	0.1	$9.5 \times 10^{-3}$
$^{234}\text{U}$		100	0.1	$6.2 \times 10^{-3}$
$^{235}\text{U}$		100	0.2	$2.1 \times 10^{-6}$
$^{236}\text{U}$		200	0.2	$6.3 \times 10^{-5}$
$^{238}\text{U}$		Unlimited	Unlimited	$3.3 \times 10^{-7}$
$\text{U}$ (natural)		Unlimited	Unlimited	****
$\text{U}$ (enriched):				
<20 percent		Unlimited	Unlimited	****
20 percent or greater		100	0.1	****
$\text{U}$ (depleted)		Unlimited	Unlimited	****
$\text{U}$ (irradiated)***				
$^{48}\text{V}$	Vanadium (23)	6	6	$1.7 \times 10^5$
$^{181}\text{W}$	Tungsten (74)	200	100	$5.0 \times 10^3$
$^{185}\text{W}$		1000	25	$9.7 \times 10^{-3}$
$^{187}\text{W}$		40	20	$7.0 \times 10^5$
$^{127}\text{Xe}$ (uncompressed)*	Xenon (54)	70	70	$2.8 \times 10^4$
$^{127}\text{Xe}$ (compressed)*		5	5	$2.8 \times 10^4$
$^{131\text{m}}\text{Xe}$ (compressed)*		10	10	$1.0 \times 10^5$
$^{131\text{m}}\text{Xe}$ (uncompressed)*		100	100	$1.0 \times 10^5$
$^{133}\text{Xe}$ (uncompressed)*		1000	1000	$1.9 \times 10^5$
$^{133}\text{Xe}$ (compressed)*		5	5	$1.9 \times 10^5$
$^{135}\text{Xe}$ (uncompressed)*		70	70	$2.5 \times 10^5$
$^{135}\text{Xe}$ (compressed)*		2	2	$2.5 \times 10^5$
$^{87}\text{Y}$	Yttrium (39)	20	20	$4.5 \times 10$
$^{90}\text{Y}$		10	10	$2.5 \times 10^5$
$^{91\text{m}}\text{Y}$		30	30	$4.1 \times 10^7$
$^{91}\text{Y}$		30	30	$2.5 \times 10^4$
$^{92}\text{Y}$		10	10	$9.5 \times 10^6$
$^{93}\text{Y}$		10	10	$3.2 \times 10^6$
$^{169}\text{Yb}$	Ytterbium (70)	80	80	$2.3 \times 10^5$
$^{175}\text{Yb}$		400	25	$1.8 \times 10^5$

Symbol of Radionuclide	Element and Atomic Number	A1(Ci)	A2(Ci)	Specific Activity (Ci/g)
$^{65}_{Zn}$	Zinc (30)	30	30	$8.0 \times 10^3$
$^{69m}_{Zn}$		40	20	$3.3 \times 10^6$
$^{69}_{Zn}$		300	20	$5.3 \times 10^7$
$^{93}_{Zr}$	Zirconium (40)	1000	200	$3.5 \times 10^{-3}$
$^{95}_{Zr}$		20	20	$2.1 \times 10^4$
$^{97}_{Zr}$		20	20	$2.0 \times 10^6$

\* For the purpose of this appendix, compressed gas means a gas at a pressure which exceeds the ambient atmospheric pressure at the location where the containment system was closed.

\*\* The values of A1 and A2 must be calculated in accordance with the procedure specified in 10 CFR 71, Appendix A, paragraph II(3), taking into account the activity of the fission products and of the uranium-233 in addition to that of the thorium.

\*\*\* The values of A1 and A2 must be calculated in accordance with the procedure specified in 10 CFR 71, Appendix A, paragraph II(3), taking into account the activity of the fission products and plutonium isotopes in addition to that of the uranium.

\*\*\*\* Activity-Mass Relationships for Uranium/Thorium.

Thorium and uranium enrichment <sup>a</sup> wt % $^{235}\text{U}$ present	Specific Activity	
	Ci/g	g/Ci
0.45	$5.0 \times 10^{-7}$	$2.0 \times 10^6$
0.72 (natural)	$7.06 \times 10^{-7}$	$1.42 \times 10^6$
1.0	$7.6 \times 10^{-7}$	$1.3 \times 10^6$
1.5	$1.0 \times 10^{-6}$	$1.0 \times 10^6$
5.0	$2.7 \times 10^{-6}$	$3.7 \times 10^5$
10.0	$4.8 \times 10^{-6}$	$2.1 \times 10^5$
20.0	$1.0 \times 10^{-5}$	$1.0 \times 10^5$
35.0	$2.0 \times 10^{-5}$	$5.0 \times 10^4$
50.0	$2.5 \times 10^{-5}$	$4.0 \times 10^4$
90.0	$5.8 \times 10^{-5}$	$1.7 \times 10^4$
93.0	$7.0 \times 10^{-5}$	$1.4 \times 10^4$
95.0	$9.1 \times 10^{-5}$	$1.1 \times 10^4$
Natural Thorium	$2.2 \times 10^{-7}$	$4.6 \times 10^6$

<sup>1</sup> The figures for uranium include representative values for the activity of the uranium-234 which is concentrated during the enrichment process. The activity for Thorium includes the equilibrium concentration of Thorium-228.

**Organ Dose Weighting Factors**  
(10 CFR 20.1003)

Organ or Tissue	$W_T$
Gonads	0.25
Breast	0.15
Red Bone Marrow	0.12
Lung	0.12
Thyroid	0.03
Bone Surfaces	0.03
Remainder	0.30 <sup>a</sup>
Whole Body	1.00 <sup>b</sup>

<sup>a</sup> 0.30 results from 0.06 for each five "remainder" organs (excluding the skin and the lens of the eye) that receive the highest doses.

<sup>b</sup> For the purpose of weighting the external whole body dose (for adding it to the internal dose), a single weighting factor,  $W_T = 1.0$ , has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.



**Appendix 19-5**

**NRC Regional Offices**  
(10 CFR 20, Appendix D)

<b>Region</b>	<b>Address</b>	<b>Telephone (24 h)</b>
Region I: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont	USNRC, Region I 475 Allendale Road King of Prussia, PA 19406	(610) 337-5000 (FTS) 346-5000
Region II: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, Virgin Islands, and West Virginia	USNRC, Region II 101 Marietta Street, NW. Suite 2900 Atlanta, GA 30323	(404) 331-4503 (FTS) 841-4503
Region III: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin	USNRC, Region III 801 Warrenville Road Lisle, IL 60532-4351	(708) 829-9500 (FTS) 829-9500
Region IV: Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming	USNRC, Region IV 611 Ryan Plaza Drive, Suite 1000 Arlington, TX 76011	(817) 860-8100 (FTS) 728-8100
Region V: Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington, and U.S. territories and possessions in the Pacific	USNRC, Region V 1450 Marla Lane, Suite 210 Walnut Creek, CA 94596	(510) 975-0200



## Appendix 19-6

### Quantities<sup>1</sup> of Licensed Material Requiring Labeling (10 CFR 20 Appendix C)

Radionuclide	Quantity ( $\mu$ Ci)
Hydrogen-3	1000
Beryllium-7	1000
Beryllium-10	1
Carbon-11	1000
Carbon-14	100
Fluorine-18	1000
Sodium-22	10
Sodium-24	100
Magnesium-28	100
Aluminum-26	10
Silicon-31	1000
Silicon-32	1
Phosphorus-32	10
Phosphorus-33	100
Sulfur-35	100
Chlorine-36	10
Chlorine-38	1000
Chlorine-39	1000
Argon-39	1000
Argon-41	1000
Potassium-40	100
Potassium-42	1000
Potassium-43	1000
Potassium-44	1000
Potassium-45	1000
Calcium-41	100
Calcium-45	100
Calcium-47	100
Scandium-43	1000
Scandium-44m	100
Scandium-44	100
Scandium-46	10
Scandium-47	100
Scandium-48	100
Scandium-49	1000
Titanium-44	1
Titanium-45	1000
Vanadium-47	1000
Vanadium-48	100
Vanadium-49	1000
Chromium-48	1000
Chromium-49	1000
Chromium-51	1000
Manganese-51	1000
Manganese-52m	1000
Manganese-52	100

Radionuclide	Quantity ( $\mu$ Ci)
Manganese-53	1000
Manganese-54	100
Manganese-56	1000
Iron-52	100
Iron-55	100
Iron-59	10
Iron-60	1
Cobalt-55	100
Cobalt-56	10
Cobalt-57	100
Cobalt-58m	1000
Cobalt-58	100
Cobalt-60m	1000
Cobalt-60	1
Cobalt-61	1000
Cobalt-62m	1000
Nickel-56	100
Nickel-57	100
Nickel-59	100
Nickel-63	100
Nickel-65	1000
Nickel-66	10
Copper-60	1000
Copper-61	1000
Copper-64	1000
Copper-67	1000
Zinc-62	100
Zinc-63	1000
Zinc-65	10
Zinc-69m	100
Zinc-69	1000
Zinc-71m	1000
Zinc-72	100
Gallium-65	1000
Gallium-66	100
Gallium-67	1000
Gallium-68	1000
Gallium-70	1000
Gallium-72	100
Gallium-73	1000
Germanium-66	1000
Germanium-67	1000
Germanium-68	10
Germanium-69	1000
Germanium-71	1000
Germanium-75	1000
Germanium-77	1000
Germanium-78	1000
Arsenic-69	1000
Arsenic-70	1000
Arsenic-71	100

Radionuclide	Quantity ( $\mu$ Ci)
Arsenic-72	100
Arsenic-73	100
Arsenic-74	100
Arsenic-76	100
Arsenic-77	100
Arsenic-78	1000
Selenium-70	1000
Selenium-73m	1000
Selenium-73	100
Selenium-75	100
Selenium-79	100
Selenium-81m	1000
Selenium-81	1000
Selenium-83	1000
Bromine-74m	1000
Bromine-74	1000
Bromine-75	1000
Bromine-76	100
Bromine-77	1000
Bromine-80m	1000
Bromine-80	1000
Bromine-82	100
Bromine-83	1000
Bromine-84	1000
Krypton-74	1000
Krypton-76	1000
Krypton-77	1000
Krypton-79	1000
Krypton-81	1000
Krypton-83m	1000
Krypton-85m	1000
Krypton-85	1000
Krypton-87	1000
Krypton-88	1000
Rubidium-79	1000
Rubidium-81m	1000
Rubidium-81	1000
Rubidium-82m	1000
Rubidium-83	100
Rubidium-84	100
Rubidium-86	100
Rubidium-87	100
Rubidium-88	1000
Rubidium-89	1000
Strontium-80	100
Strontium-81	1000
Strontium-83	100
Strontium-85m	1000
Strontium-85	100
Strontium-87m	1000
Strontium-89	10

Radionuclide	Quantity ( $\mu$ Ci)
Strontium-90	0.1
Strontium-91	100
Strontium-92	100
Yttrium-86m	1000
Yttrium-86	100
Yttrium-87	100
Yttrium-88	10
Yttrium-90m	1000
Yttrium-90	10
Yttrium-91m	1000
Yttrium-91	10
Yttrium-92	100
Yttrium-93	100
Yttrium-94	1000
Yttrium-95	1000
Zirconium-86	100
Zirconium-88	10
Zirconium-89	100
Zirconium-93	1
Zirconium-95	10
Zirconium-97	100
Niobium-88	1000
Niobium-89m (66 min)	1000
Niobium-89 (122 min)	1000
Niobium-90	100
Niobium-93m	10
Niobium-94	1
Niobium-95m	100
Niobium-95	100
Niobium-96	100
Niobium-97	1000
Niobium-98	1000
Molybdenum-90	100
Molybdenum-93m	100
Molybdenum-93	10
Molybdenum-99	100
Molybdenum-101	1000
Technetium-93m	1000
Technetium-93	1000
Technetium-94m	1000
Technetium-94	1000
Technetium-96m	1000
Technetium-96	100
Technetium-97m	100
Technetium-97	1000
Technetium-98	10
Technetium-99m	1000
Technetium-99	100
Technetium-101	1000

Radionuclide	Quantity ( $\mu\text{Ci}$ )
Technetium-104	1000
Ruthenium-94	1000
Ruthenium-97	1000
Ruthenium-103	100
Ruthenium-105	1000
Ruthenium-106	1
Rhodium-99m	1000
Rhodium-99	100
Rhodium-100	100
Rhodium-101m	1000
Rhodium-101	10
Rhodium-102m	10
Rhodium-102	10
Rhodium-103m	1000
Rhodium-105	100
Rhodium-106m	1000
Rhodium-107	1000
Palladium-100	100
Palladium-101	1000
Palladium-103	100
Palladium-107	10
Palladium-109	100
Silver-102	1000
Silver-103	1000
Silver-104m	1000
Silver-104	1000
Silver-105	100
Silver-106m	100
Silver-106	1000
Silver-108m	1
Silver-110m	10
Silver-111	100
Silver-112	100
Silver-115	1000
Cadmium-104	1000
Cadmium-107	1000
Cadmium-109	1
Cadmium-113m	0.1
Cadmium-113	100
Cadmium-115m	10
Cadmium-115	100
Cadmium-117m	1000
Cadmium-117	1000
Indium-109	1000
Indium-110 (69.1 min)	1000
Indium-110 (4.9h)	1000
Indium-111	100
Indium-112	1000
Indium-113m	1000

Radionuclide	Quantity ( $\mu$ Ci)
Indium-114m	10
Indium-115m	1000
Indium-115	100
Indium-116m	1000
Indium-117m	1000
Indium-117	1000
Indium-119m	1000
Tin-110	100
Tin-111	1000
Tin-113	100
Tin-117m	100
Tin-119m	100
Tin-121m	100
Tin-121	1000
Tin-123m	1000
Tin-123	10
Tin-125	10
Tin-126	10
Tin-127	1000
Tin-128	1000
Antimony-115	1000
Antimony-116m	1000
Antimony-116	1000
Antimony-117	1000
Antimony-118m	1000
Antimony-119	1000
Antimony-120	1000
(16 min)	
Antimony-120	100
(5.76d)	
Antimony-122	100
Antimony-124m	1000
Antimony-124	10
Antimony-125	100
Antimony-126m	1000
Antimony-126	100
Antimony-127	100
Antimony-128	1000
(10.4 min)	
Antimony-128	100
(9.01h)	
Antimony-129	100
Antimony-130	1000
Antimony-131	1000
Tellurium-116	1000
Tellurium-121m	10
Tellurium-121	100
Tellurium-123m	10
Tellurium-123	100
Tellurium-125m	10
Tellurium-127m	10

Radionuclide	Quantity ( $\mu$ Ci)
Tellurium-127	1000
Tellurium-129m	10
Tellurium-129	1000
Tellurium-131m	10
Tellurium-131	100
Tellurium-132	10
Tellurium-133m	100
Tellurium-133	1000
Tellurium-134	1000
Iodine-120m	1000
Iodine-120	100
Iodine-121	1000
Iodine-123	100
Iodine-124	10
Iodine-125	1
Iodine-126	1
Iodine-128	1000
Iodine-129	1
Iodine-130	10
Iodine-131	1
Iodine-132m	100
Iodine-132	100
Iodine-133	10
Iodine-134	1000
Iodine-135	100
Xenon-120	1000
Xenon-121	1000
Xenon-122	1000
Xenon-123	1000
Xenon-125	1000
Xenon-127	1000
Xenon-129m	1000
Xenon-131m	1000
Xenon-133m	1000
Xenon-133	1000
Xenon-135m	1000
Xenon-135	1000
Xenon-138	1000
Cesium-125	1000
Cesium-127	1000
Cesium-129	1000
Cesium-130	1000
Cesium-131	1000
Cesium-132	100
Cesium-134m	1000
Cesium-134	10
Cesium-135m	1000
Cesium-135	100
Cesium-136	10
Cesium-137	10
Cesium-138	1000

Radionuclide	Quantity ( $\mu$ Ci)
Barium-126	1000
Barium-128	100
Barium-131m	1000
Barium-131	100
Barium-133m	100
Barium-133	100
Barium-135m	100
Barium-139	1000
Barium-140	100
Barium-141	1000
Barium-142	1000
Lanthanum-131	1000
Lanthanum-132	100
Lanthanum-135	1000
Lanthanum-137	10
Lanthanum-138	100
Lanthanum-140	100
Lanthanum-141	100
Lanthanum-142	1000
Lanthanum-143	1000
Cerium-134	100
Cerium-135	100
Cerium-137m	100
Cerium-137	1000
Cerium-139	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Praseodymium-136	1000
Praseodymium-137	1000
Praseodymium-138m	1000
Praseodymium-139	1000
Praseodymium-142m	1000
Praseodymium-142	100
Praseodymium-143	100
Praseodymium-144	1000
Praseodymium-145	100
Praseodymium-147	1000
Neodymium-136	1000
Neodymium-138	100
Neodymium-139m	1000
Neodymium-139	1000
Neodymium-141	1000
Neodymium-147	100
Neodymium-149	1000
Neodymium-151	1000
Promethium-141	1000
Promethium-143	100
Promethium-144	10

Radionuclide	Quantity ( $\mu$ Ci)
Promethium-145	10
Promethium-146	1
Promethium-147	10
Promethium-148m	10
Promethium-148	10
Promethium-149	100
Promethium-150	1000
Promethium-151	100
Samarium-141m	1000
Samarium-141	1000
Samarium-142	1000
Samarium-145	100
Samarium-146	1
Samarium-147	100
Samarium-151	10
Samarium-153	100
Samarium-155	1000
Samarium-156	1000
Europium-145	100
Europium-146	100
Europium-147	100
Europium-148	10
Europium-149	100
Europium-150 (12.62h)	100
Europium-150 (34.2y)	1
Europium-152m	100
Europium-152	1
Europium-154	1
Europium-155	10
Europium-156	100
Europium-157	100
Europium-158	1000
Gadolinium-145	1000
Gadolinium-146	10
Gadolinium-147	100
Gadolinium-148	0.001
Gadolinium-149	100
Gadolinium-151	10
Gadolinium-152	100
Gadolinium-153	10
Gadolinium-159	100
Terbium-147	1000
Terbium-149	100
Terbium-150	1000
Terbium-151	100
Terbium-153	1000
Terbium-154	100
Terbium-155	1000
Terbium-156m	1000

Radionuclide	Quantity ( $\mu$ Ci)
(5.0h)	
Terbium-156m	1000
(24.4h)	
Terbium-156	100
Terbium-157	10
Terbium-158	1
Terbium-160	10
Terbium-161	100
Dysprosium-155	1000
Dysprosium-157	1000
Dysprosium-159	100
Dysprosium-165	1000
Dysprosium-166	100
Holmium-155	1000
Holmium-157	1000
Holmium-159	1000
Holmium-161	1000
Holmium-162m	1000
Holmium-162	1000
Holmium-164m	1000
Holmium-164	1000
Holmium-166m	1
Holmium-166	100
Holmium-167	1000
Erbium-161	1000
Erbium-165	1000
Erbium-169	100
Erbium-171	100
Erbium-172	100
Thulium-162	1000
Thulium-166	100
Thulium-167	100
Thulium-170	10
Thulium-171	10
Thulium-172	100
Thulium-173	100
Thulium-175	1000
Ytterbium-162	1000
Ytterbium-166	100
Ytterbium-167	1000
Ytterbium-169	100
Ytterbium-175	100
Ytterbium-177	1000
Ytterbium-178	1000
Lutetium-169	100
Lutetium-170	100
Lutetium-171	100
Lutetium-172	100
Lutetium-173	10
Lutetium-174m	10
Lutetium-174	10

Radionuclide	Quantity ( $\mu$ Ci)
Lutetium-176m	1000
Lutetium-176	100
Lutetium-177m	10
Lutetium-177	100
Lutetium-178m	1000
Lutetium-178	1000
Lutetium-179	1000
Hafnium-170	100
Hafnium-172	1
Hafnium-173	1000
Hafnium-175	100
Hafnium-177m	1000
Hafnium-178m	0.1
Hafnium-179m	10
Hafnium-180m	1000
Hafnium-180	100
Hafnium-182m	1000
Hafnium-182	0.1
Hafnium-183	1000
Hafnium-184	100
Tantalum-172	1000
Tantalum-173	1000
Tantalum-174	1000
Tantalum-175	1000
Tantalum-176	100
Tantalum-177	1000
Tantalum-178	1000
Tantalum-179	100
Tantalum-180m	1000
Tantalum-180	100
Tantalum-182m	1000
Tantalum-182	10
Tantalum-183	100
Tantalum-184	100
Tantalum-185	1000
Tantalum-186	1000
Tungsten-176	1000
Tungsten-177	1000
Tungsten-178	1000
Tungsten-179	1000
Tungsten-181	1000
Tungsten-185	100
Tungsten-187	100
Tungsten-188	10
Rhenium-177	1000
Rhenium-178	1000
Rhenium-181	1000
Rhenium-182	1000
(12.7h)	
Rhenium-182	100
(64.0h)	

Radionuclide	Quantity ( $\mu$ Ci)
Rhenium-184m	10
Rhenium-184	100
Rhenium-186m	10
Rhenium-186	100
Rhenium-187	1000
Rhenium-188m	1000
Rhenium-188	100
Rhenium-189	100
Osmium-180	1000
Osmium-181	1000
Osmium-182	100
Osmium-185	100
Osmium-189m	1000
Osmium-191m	1000
Osmium-191	100
Osmium-193	100
Osmium-194	1
Iridium-182	1000
Iridium-184	1000
Iridium-185	1000
Iridium-186	100
Iridium-187	1000
Iridium-188	100
Iridium-189	100
Iridium-190m	1000
Iridium-190	100
Iridium-192	1
(73.8d)	
Iridium-192	10
(1.4min)	
Iridium-194m	10
Iridium-194	100
Iridium-195m	1000
Iridium-195	1000
Platinum-186	1000
Platinum-188	100
Platinum-189	1000
Platinum-191	100
Platinum-193m	100
Platinum-193	1000
Platinum-195m	100
Platinum-197m	1000
Platinum-197	100
Platinum-199	1000
Platinum-200	100
Gold-193	1000
Gold-194	100
Gold-195	10
Gold-198m	100
Gold-198	100
Gold-199	100

Radionuclide	Quantity ( $\mu\text{Ci}$ )
Gold-200m	100
Gold-200	1000
Gold-201	1000
Mercury-193m	100
Mercury-193	1000
Mercury-194	1
Mercury-195m	100
Mercury-195	1000
Mercury-197m	100
Mercury-197	1000
Mercury-199m	1000
Mercury-203	100
Thallium-194m	1000
Thallium-194	1000
Thallium-195	1000
Thallium-197	1000
Thallium-198m	1000
Thallium-198	1000
Thallium-199	1000
Thallium-200	1000
Thallium-201	1000
Thallium-202	100
Thallium-204	100
Lead-195m	1000
Lead-198	1000
Lead-199	1000
Lead-200	100
Lead-201	1000
Lead-202m	1000
Lead-202	10
Lead-203	1000
Lead-205	100
Lead-209	1000
Lead-210	0.01
Lead-211	100
Lead-212	1
Lead-214	100
Bismuth-200	1000
Bismuth-201	1000
Bismuth-202	1000
Bismuth-203	100
Bismuth-205	100
Bismuth-206	100
Bismuth-207	10
Bismuth-210m	0.1
Bismuth-210	1
Bismuth-212	10
Bismuth-213	10
Bismuth-214	100
Polonium-203	1000
Polonium-205	1000

Radionuclide	Quantity ( $\mu\text{Ci}$ )
Polonium-207	1000
Polonium-210	0.1
Astatine-207	100
Astatine-211	10
Radon-220	1
Radon-222	1
Francium-222	100
Francium-223	100
Radium-223	0.1
Radium-224	0.1
Radium-225	0.1
Radium-226	0.1
Radium-227	1000
Radium-228	0.1
Actinium-224	1
Actinium-225	0.01
Actinium-226	0.1
Actinium-227	0.001
Actinium-228	1
Thorium-226	10
Thorium-227	0.01
Thorium-228	0.001
Thorium-229	0.001
Thorium-230	0.001
Thorium-231	100
Thorium-232	100
Thorium-234	10
Thorium-natural	100
Protactinium-227	10
Protactinium-228	1
Protactinium-230	0.1
Protactinium-231	0.001
Protactinium-232	1
Protactinium-233	100
Protactinium-234	100
Uranium-230	0.01
Uranium-231	100
Uranium-232	0.001
Uranium-233	0.001
Uranium-234	0.001
Uranium-235	0.001
Uranium-236	0.001
Uranium-237	100
Uranium-238	100
Uranium-239	1000
Uranium-240	100
Uranium-natural	100
Neptunium-232	100
Neptunium-233	1000
Neptunium-234	100
Neptunium-235	100

Radionuclide	Quantity ( $\mu\text{Ci}$ )
Neptunium-236 ( $1.15 \times 10^5 \text{y}$ )	0.001
Neptunium-236 (22.5h)	1
Neptunium-237	0.001
Neptunium-238	10
Neptunium-239	100
Neptunium-240	1000
Plutonium-234	10
Plutonium-235	1000
Plutonium-236	0.001
Plutonium-237	100
Plutonium-238	0.001
Plutonium-239	0.001
Plutonium-240	0.001
Plutonium-241	0.01
Plutonium-242	0.001
Plutonium-243	1000
Plutonium-244	0.001
Plutonium-245	100
Americium-237	1000
Americium-238	100
Americium-239	1000
Americium-240	100
Americium-241	0.001
Americium-242m	0.001
Americium-242	10
Americium-243	0.001
Americium-244m	100
Americium-244	10
Americium-245	1000
Americium-246m	1000
Americium-246	1000
Curium-238	100
Curium-240	0.1
Curium-241	1
Curium-242	0.01
Curium-243	0.001
Curium-244	0.001
Curium-245	0.001
Curium-246	0.001
Curium-247	0.001
Curium-248	0.001
Curium-249	1001
Berkelium-245	100
Berkelium-246	100
Berkelium-247	0.001
Berkelium-249	0.1
Berkelium-250	10
Californium-244	100
Californium-246	1

Radionuclide	Quantity ( $\mu$ Ci)
Californium-248	0.01
Californium-249	0.001
Californium-250	0.001
Californium-251	0.001
Californium-252	0.001
Californium-253	0.1
Californium-254	0.001
Any alpha emitting radionuclide not listed above or mix- tures of alpha emit- ters of unknown composition.	0.001
Einsteinium-250	100
Einsteinium-251	100
Einsteinium-253	0.1
Einsteinium-254m	1
Einsteinium-254	0.01
Fermium-252	1
Fermium-253	1
Fermium-254	10
Fermium-255	1
Fermium-257	0.01
Mendelevium-257	10
Mendelevium-258	0.01
Any radionuclide other than alpha emitting radionu- clides not listed above, or mixtures of beta emitters of unknown composition.	0.01

Appendix 19-7

Removable External Radioactive Contamination Wipe Limits  
(10 CFR 71.87(i)(1))

Contaminant	Maximum Permissible Limits	
	$\mu\text{Ci}/\text{cm}^2$	dpm/cm <sup>2</sup>
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than 10 days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical concentrates.	$10^{-5}$	22.0
All other alpha emitting radionuclides.	$10^{-6}$	02.2



## Appendix 19-8

### Quantity Limits for Byproduct Material (10 CFR 20.2206(a)(7))

Radionuclide	Quantity of radionuclide <sup>a</sup> in curies
Cesium-137	1
Cobalt-60	1
Gold-198	100
Iodine-131	1
Iridium-192	10
Krypton-85	1000
Promethium-147	10
Techetium-99m	1000

<sup>a</sup> The Commission may require as a license condition, or by-rule, regulation, or order pursuant to 10 CFR 20.2302, reports from installations that are licensed to use radionuclides not on this list, in quantities sufficient to cause comparable radiation levels.



# Appendix 19-9

## Protection Factors for Respirators<sup>a</sup> (10 CFR 20 Appendix A)

Description <sup>b</sup>	Protection Factors <sup>d</sup>			Tested and Certified Equipment
	Modes <sup>c</sup>	Particulates only	Particulates, gases, and vapors <sup>e</sup>	NIOSH/MSHA tests for permissibility
I. Air-Purifying Respirators: <sup>f</sup>				
Facepiece, half-mask <sup>g</sup>	NP	10		30 CFR 11, Subpart K
Facepiece, full	NP	50		
Facepiece, half-mask, full, or hood	PP	1000		
II. Atmosphere-Supplying Respirators:				
1. Air-line respirator:				
Facepiece, half-mask	CF		1000	30 CFR 11, Subpart J
Facepiece, half-mask	D		5	
Facepiece, full	CF		2000	
Facepiece, full	D		5	
Facepiece, full	PD		2000	
Hood	CF		(h)	
Suit	CF		(i)	(j)
2. Self-contained breathing apparatus (SCBA):				
Facepiece, full	D		50	30 CFR 11, Subpart H
Facepiece, full	PD		k10,000	
Facepiece, full	RD		50	
Facepiece, full	RP		15000	
III. Combination Respirators:				
Any combination of air-purifying and atmosphere-supplying respirators.	Protection factor for type and mode of operation as listed above.			30 CFR 11.11.63(b)

<sup>a</sup>For use in the selection of respiratory protective devices to be used only where the contaminants have been identified and the concentrations (or possible concentrations) are known.

<sup>b</sup>Only for shaven faces and where nothing interferes with the seal of tight-fitting facepieces against the skin. (Hoods and suits are excepted.)

<sup>c</sup>The mode symbols are defined as follows:

- CF = continuous flow
- D = demand
- NP = negative pressure (i.e., negative phase during inhalation)
- PD = pressure demand (i.e., always positive pressure)
- PP = positive pressure
- RD = demand, recirculating (closed circuit)
- RP = pressure demand, recirculating (closed circuit)

<sup>d</sup>(1) The protection factor is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive material outside the respiratory protective equipment to that inside the equipment (usually inside the facepiece) under conditions of use. It is applied to the ambient airborne concentration to estimate the concentrations inhaled by the wearer according to the following formula:

$$\text{Concentration inhaled} = \text{Ambient airborne concentration} / \text{Protective factor}$$

(2) The protection factors apply:

- (a) Only for individuals trained in using respirators and wearing properly fitted respirators that are used and maintained under supervision in a well-planned respiratory protection program.
- (b) For air-purifying respirators only when high efficiency particulate filters (above 99.97 percent removal efficiency by thermally generated 0.3  $\mu\text{m}$  DOP test or equivalent) are used in atmospheres not deficient in oxygen and not containing radioactive gas or vapor respiratory hazards.
- (c) No adjustment is to be made for the use of sorbents against radioactive material in the form of gases or vapors.
- (d) For atmosphere-supplying respirators only when supplied with adequate respirable air. Respirable air must be provided of the quality and quantity required in accordance with NIOSH/MSHA certification (described in 30 CFR part 11). Oxygen and air must not be used in the same apparatus.

<sup>e</sup>Excluding radioactive contaminants that present an absorption or submersion hazard. For tritium oxide, approximately one-third of the intake occurs by absorption through the skin so that an overall protection factor of less than 2 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. If the protection factor for a device is 5, the effective protection factor for tritium is about 1.4; for devices with protection factors of 10, the effective factor is about 1.7; and for devices with protection factors of 100 or more, the effective factor for tritium oxide is 1.9. Air-purifying respirators are not suitable for protection against tritium oxide. See also footnote i concerning supplied-air suits.

<sup>f</sup>Canisters and cartridges shall not be used beyond service-life limitations.

<sup>g</sup>Under-chin type only. This type of respirator is not satisfactory for use where it might be possible (e.g., if an accident or emergency were to occur) for the ambient airborne concentrations to reach instantaneous values greater than 10 times the pertinent values in Appendix 14-1. This type of respirator is not suitable for protection against plutonium or other high-toxicity materials. The mask is to be tested for fit prior to use, each time it is donned.

<sup>h</sup>(1) Equipment must be operated in a manner that ensures the proper air flowrates are maintained. A protection factor of no more than 1000 may be utilized for tested-and-certified supplied-air hoods when a minimum air flow of 6  $\text{ft}^3/\text{min}$  (0.17  $\text{m}^3/\text{min}$ ) is maintained and calibrated air-line pressure gauges or flow measuring devices are used. A protection factor of up to 2000 may be used for tested and certified hoods only when the air flow is maintained at the

turer's recommended maximum rate for the equipment, this rate is greater than 6 ft<sup>3</sup>/min (0.17 m<sup>3</sup>/min), and calibrated air-line pressure gauges or flow measuring devices are used.

(2) The design of the supplied-air hood or helmet (with a minimum flow of 6 cfm/min (0.17 m<sup>3</sup>/min) of air may determine its overall efficiency and the protection it provides. For example, some hoods aspirate contaminated air into the breathing zone when the wearer works with hands-over-head. This aspiration may be overcome if a short cape-like extension to the hood is worn under a coat or overalls. Other limitations specified by the approval agency must be considered before using a hood in certain types of atmospheres. (See footnote i.)

<sup>i</sup>Appropriate protection factors must be determined, taking into account the design of the suit and its permeability to the contaminant under conditions of use. There must be a standby rescue person equipped with a respirator or other apparatus appropriate for the potential hazards and communications equipment whenever supplied-air suits are used.

<sup>j</sup>No approval schedules are currently available for this equipment. Equipment is to be evaluated by testing or on the basis of reliable test information.

<sup>k</sup>This type of respirator may provide greater protection and be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure, such as skin absorption, must be taken into account in such circumstances.

<sup>l</sup>Quantitative fit testing must be performed on each individual and no more than 0.02 percent leakage is allowed with this type of apparatus. Perceptible outward leakage of gas from this or any positive pressure self-contained breathing apparatus is unacceptable because service life will be reduced substantially. Special training in the use of this type of apparatus must be provided to the wearer.

(NOTE: Protection factors for respirators as may be approved by the U.S. Bureau of Mines/ NIOSH, according to applicable approvals for respirators for type and mode of use to protect against airborne radionuclides, may be used to the extent that they do not exceed the protection factors listed in this appendix. The protection factors listed in this appendix may not be appropriate to circumstances where chemical or other respiratory hazards exist in addition to radioactive hazards. The selection and use of respirators for such circumstances should take into account applicable approvals of the U.S. Bureau of Mines/NIOSH.)

(NOTE: Radioactive contaminants for which the concentration values in Appendix 14-1 are based on internal dose due to inhalation may, in addition, present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.)



## **Addendum 19-1**

### **Demonstrating Compliance** (10 CFR 20)

The installation must use the following guidelines in order to demonstrate appropriate dose limit compliance.

#### **I. Occupational Dose Limits**

1. DAC and ALI values are presented in Appendix B to 10 CFR 20 and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits. (10 CFR 20.1201(d))
2. The dose to an embryo/fetus is the sum of:
  - a. the deep-dose equivalent to the declared pregnant woman
  - b. the dose to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman (10 CFR 20.1208(c) and (d)).

(NOTE: If the dose to the embryo/fetus is found to have exceeded 0.5 rem (5 mSv), or is within 0.05 rem (0.5 mSv) of this dose, by the time the woman declares the pregnancy to the installation's authorities, the installation shall be deemed to be in compliance with the limit if the additional dose to the embryo/fetus does not exceed 0.05 rem (0.5 mSv) during the remainder of the pregnancy.)

3. The assigned deep-dose equivalent and shallow-dose equivalent must be for the part of the body receiving the highest exposure (10 CFR 20.1201(c)).
4. The deep-dose equivalent, eye dose equivalent and shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable (10 CFR 20.1201(c)).
5. Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, must be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime (see checklist item IR.40.4) (10 CFR 20.1201(b)).
6. The installation must reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person (see checklist item IR.180.10) (10 CFR 20.1201(f)).

#### **II. Dose Limits for Individual Members of the Public**

1. The installation must show compliance with the annual dose limit for individual members of the public by either:
  - a. demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit
  - b. demonstrating that:
    - i. the annual average concentration of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Appendix B to 10 CFR 20
    - ii. if an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year (10 CFR 20.1302(b)).

2. An installation may apply for prior NRC authorization to operate up to an annual dose limit for an individual member of the public of 0.5 rem (5 mSv). The installation must include the following information in this application:
  - a. demonstration of the need for and the expected duration of operations in excess of the limit
  - b. the installation's program to assess and control dose within the 0.5 rem (5 mSv) annual limit
  - c. the procedures to be followed to maintain the dose as low as is reasonably achievable (10 CFR 20.1301(c)).
3. Upon approval from the Commission, the installation may adjust the effluent concentration values in Table 2 of Appendix B to 10 CFR 20 for members of the public to take into account the actual physical and chemical characteristics of the effluents (e.g., aerosol size distribution, solubility, density, radioactive decay equilibrium, chemical form) (10 CFR 20.1302(c)).
4. The Commission may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that an installation may release in order to restrict the collective dose. (10 CFR 20.1301(e)).

### III. External Dose from Airborne Radioactive Material

Installations must, when determining the dose from airborne radioactive material, include the contribution to the deep-dose equivalent, eye dose equivalent, and shallow-dose equivalent from external exposure to the radioactive cloud (see Appendix B to 10 CFR 20, footnotes 1 and 2) (10 CFR 20.1203).

(NOTE: Airborne radioactivity measurements and DAC values should not be used as the primary means to assess the deep-dose equivalent when the airborne radioactive material includes radionuclides other than noble gases or if the cloud of airborne radioactive material is not relatively uniform.)

### IV. Internal Exposure

1. For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the installation must, when required under 10 CFR 20.1502 (see checklist items IR.50.5 and IR.50.6) take suitable and timely measurements of one of the following:
  - a. concentrations of radioactive materials in air or in work areas
  - b. quantities of radionuclides in the body
  - c. quantities of radionuclides excreted from the body
  - d. combinations of these measurements (10 CFR 20.1204(a)).
2. Unless respiratory protective equipment is used or the assessment of intake is based on bioassays, the installation must assume that an individual inhales radioactive material at the airborne concentration in which the individual is present (10 CFR 20.1204(b)).
3. When specific information on the physical and biochemical properties of the radionuclides taken into the body or the behavior of the material in an individual is known, the installation may:
  - a. use that information to calculate the committed effective dose equivalent and, if used, the installation must document that information in the individual's record
  - b. upon prior approval of the Commission, adjust the DAC and ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material (e.g aerosol size distribution or density)
  - c. separately assess the contribution of fractional intakes of Class D, W, or Y compounds of a given radionuclide to the committed effective dose equivalent (see Appendix B to 10 CFR 20) (10 CFR 20.1204(c)).
4. If the installation chooses to assess intakes of Class Y material using the measurements given in sections IV.1.B and C of Addendum 19-1, the installation may delay the reporting of the assessments for periods up to 7 mo, unless otherwise required by 10 CFR 20.2202 or 20.2203 (see checklist items IR.200.1 through IR.200.11), in order to permit the installation to make additional measurements basic to the assessments (10 CFR 20.1204(d)).

5. If the identity and concentration of each radionuclide in a mixture are known, the fraction of the DAC applicable to the mixture for use in calculating DAC-hours must be either:
  - a. The sum of the ratios of the concentration to the appropriate DAC value (e.g., D, W, Y) from Appendix B to 10 CFR 20 for each radionuclide in the mixture
  - b. The ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture (10 CFR 20.1204(e)).
6. If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture must be the most restrictive DAC of any radionuclide in the mixture (10 CFR 20.1204(f)).
7. When a mixture of radionuclides in air exists, installations may disregard certain radionuclides in the mixture provided each of the following conditions exists:
  - a. The installation uses the total activity of the mixture in demonstrating compliance with the appropriate dose limits and in complying with the monitoring requirements in 10 CFR 20.1502(b) (see checklist item IR.50.6).
  - b. The concentration of any radionuclide disregarded is less than 10 percent of its DAC.
  - c. The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30 percent (10 CFR 20.1204(g)).
8. To calculate the committed effective dose equivalent, the installation may assume that the inhalation of one ALI, or an exposure of 2000 DAC-hours, results in a committed effective dose equivalent of 5 rems (0.05 Sv) for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent (10 CFR 20.1204(h)(1)).
9. When the ALI (and the associated DAC) is determined by the nonstochastic organ dose limit of 50 rems (0.05 Sv), the intake of radionuclides that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) (the stochastic ALI) is listed in parentheses in Table 1 of Appendix B to 10 CFR 20. In this case, the installation may, as a simplifying assumption, use the stochastic ALIs to determine committed effective dose equivalent. However, if the installation uses the stochastic ALIs, the installation must also demonstrate that the appropriate dose limit is met (10 CFR 20.1204 (h)(2)).

## V. Summation of External and Internal Doses

1. Summation of external and internal doses is required only for installations required to monitor dose levels under 10 CFR 20.1502(a) and 20.1502(b) (see checklist items IR.50.5 and IR.50.6) (10 CFR 1202(a)).
2. The installation demonstrates compliance for summation of external and internal doses by meeting one of the conditions a through c (below):
  - a. Intake by inhalation: If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep-dose equivalent divided by the total effective dose equivalent limit, and one of the following, does not exceed unity:
    - i. the sum of the fractions of the inhalation ALI for each radionuclide
    - ii. the total number of DAC-hours for all radionuclides divided by 2000
    - iii. the sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues (T) calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit (10 CFR 20.1202(b)).
  - b. Intake by oral ingestion: If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10 percent of the applicable oral ALI, the installation must account for this intake and include it in demonstrating compliance with the limit (10 CFR 20.1202(c)).
  - c. Intake through wounds or absorption through skin: The installation must evaluate and, to the extent practical, account for intakes through wounds or skin absorption (10 CFR 20.1202(d)).

(NOTE: The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be further evaluated.)

## VI. Use of Respiratory Protection Equipment

1. In estimating exposure of individuals to airborne radioactive materials, the installation may make allowance for respiratory protection equipment used to limit intakes, provided that the following conditions, in addition to those listed in 10 CFR 20.1703(a) (see checklist items IR.70.3 through IR.70.7), are satisfied:
  - a. The respiratory protection equipment provides a protection factor greater than the multiple by which peak concentrations of airborne radioactive materials in the working area are expected to exceed the values specified in (see Table 1, Column 3 of Appendix B to 10 CFR 20) (10 CFR 20.1703(b)(1)).
  - b. If the selection of a respiratory protection device with a protection factor greater than the peak concentration is inconsistent with the goal of keeping the total dose equivalent ALARA, the installation may select respiratory protection equipment with a lower protection factor only if such a selection would result in keeping the total effective dose equivalent ALARA (10 CFR 20.1703(b)(1)).

(NOTE: The concentration of radioactive material in the air that is inhaled when respirators are worn may be initially estimated by dividing the average concentration in air, during each period of uninterrupted use, by the protection factor. If the exposure is later found to be greater than estimated, the corrected value must be used; if the exposure is later found to be less than estimated, the corrected value may be used.)

- c. The installation must obtain authorization from the Commission before assigning respiratory protection factors in excess of those specified in Appendix A to 10 CFR 20.1001 to 20.2401 (see Appendix 19-9). The Commission may authorize an installation to use higher protection factors on receipt of an application that:
    - i. describes the situation for which a need exists for higher protection factors
    - ii. demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use (10 CFR 20.1703(b)(2)).

## **Addendum 19-2**

### **Requirements for Low-Level-Waste Transfer for Disposal at Land Disposal Facilities and Manifests (10 CFR 20, Appendix F)**

#### **I. Manifests**

The shipment manifest must contain the name, address, and telephone number of the person generating the waste. The manifest must also include the name, address, and telephone number or the name and USEPA hazardous waste identification number of the person transporting the waste to the land disposal facility. The manifest must also indicate as completely as practical:

1. a physical description of the waste
2. the volume, radionuclide identity, and quantity of the waste
3. the total radioactivity of the waste
4. the principal chemical form of the waste.

The solidification agent must be specified. Waste containing more than 0.1 percent chelating agents by weight must be identified and the weight percentage of the chelating agent estimated. Wastes classified as Class A, Class B, or Class C in 10 CFR 61.55 must be clearly identified as such in the manifest. The total quantity of the radionuclides  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{99}\text{Tc}$ , and  $^{129}\text{I}$  must be shown. The manifest required by this paragraph may be shipping papers used to meet DOT or USEPA regulations or requirements of the receiver, provided all the required information is included. Copies of manifests required by this section may be legible carbon copies or legible photocopies.

#### **II. Certification**

The waste generator must include in the shipment manifest a certification that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the DOT and the Commission. An authorized representative of the waste generator must sign and date the manifest.

#### **III. Control and Tracking**

A. Any generating installation that transfers radioactive waste to a land disposal facility or a licensed waste collector must comply with the requirements in paragraphs A.1 through 8 of this section. Any generating installation that transfers waste to a licensed waste processor who treats or repackages waste must comply with the requirements of paragraphs A.4 through 8 of this section. An installation must:

1. Prepare all wastes so that the waste is classified according to 10 CFR 61.55 and meets the waste characteristics requirement in 10 CFR 61.56;
2. Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with 10 CFR 61.55;
3. Conduct a quality control program to ensure compliance with 10 CFR 61.55 and 61.56; the program must include management evaluation of adults;
4. Prepare shipping manifests to meet the requirements of this addendum;
5. Forward a copy of the manifest to the intended recipient, at the time of shipment, or deliver to a collector at the time waste is collected, obtaining acknowledgment of receipt in the form of a signed copy of the manifest or equivalent documentation from the collector;
6. Include one copy of the manifest with the shipment;
7. Retain a copy of the manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 10 CFR 30, 40, and 70. This includes those manifests and documents required under the standards for protection against radiation in effect prior to 1 January 1994; and

8. For any shipments or any part of a shipment for which acknowledgment has not been received within the specified times, conduct an investigation in accordance with paragraph E of this addendum.
- B. Any waste collector licensee who handles only prepackaged waste must:
1. Acknowledge receipt of the waste from the generator within 1 week of receipt by returning a signed copy of the manifest or equivalent documentation;
  2. Prepare a new manifest to reflect consolidated shipments; the new manifest shall serve as a listing or index for the detailed generator manifests. Copies of the generator manifests must be part of the new manifest. The waste collector may prepare a new manifest without attaching the generator manifests, provided the new manifest contains for each package the information specified in section I of this addendum. The collector licensee must certify that nothing has been done to the waste that would invalidate the generator's certification;
  3. Forward a copy of the new manifest to the land disposal facility operator at the time of shipment;
  4. Include the new manifest with the shipment to the disposal site;
  5. Retain a copy of the manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material required by 10 CFR 30, 40, and 70, and retain information from generator manifest until the license is terminated. This includes those manifests and documents of acknowledgment of receipt required under the standards for protection against radiation in effect prior to 1 January 1994; and
  6. For any shipments or any part of a shipment for which acknowledgment of receipt is not received within the specified times, conduct an investigation in accordance with paragraph E of this addendum.
- C. Any licensed waste processor who treats or repackages waste must:
1. Acknowledge receipt of the waste from the generator within 1 week of receipt by returning a signed copy of the manifest or equivalent documentation;
  2. Prepare a new manifest that meets the requirements of sections I and II of this addendum. Preparation of the new manifest reflects that the processor is responsible for the waste;
  3. Prepare all wastes so that the waste is classified according to 10 CFR 61.55 and meets the waste characteristics requirements in 10 CFR 61.56;
  4. Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with 10 CFR 61.55 and 61.57;
  5. Conduct a quality control program to ensure compliance with 10 CFR 61.55 and 61.56. The program must include management evaluation of audits;
  6. Forward a copy of the new manifest to the disposal site operator or waste collector at the time of shipment, or deliver to a collector at the time the waste is collected, obtaining acknowledgment of receipt in the form of a signed copy of the manifest or equivalent documentation by the collector;
  7. Include the new manifest with the shipment;
  8. Retain copies of original manifests and new manifests and documentation of acknowledgment of receipt as the record of transfer of licensed material required by 10 CFR 30, 40, and 70. This includes those manifests and documents of acknowledgment of receipt required under the standards for protection against radiation in effect prior to 1 January 1994; and
  9. For any shipment or part of a shipment for which acknowledgment is not received within the specified times, conduct an investigation in accordance with paragraph E of this addendum.
- D. The land disposal facility operator must:
1. Acknowledge receipt of waste within 1 week of receipt by returning a signed copy of the manifest or equivalent documentation to the shipper. The shipper to be notified is the licensee who last possessed the waste and transferred the waste to the operator. The returned copy of the manifest or equivalent documentation must indicate any discrepancies between materials listed on the manifest and materials received;
  2. Maintain copies of all completed manifests or equivalent documentation until the license is terminated. This includes those manifests or equivalent documents required under the standards for protection against radiation in effect prior to 1 January 1994; and

3. Notify the shipper (i.e., the generator, the collector, or processor) and the Administration of the nearest Commission Regional Office (see Appendix 19-5) when any shipment or part of a shipment has not arrived within 60 days after the advanced manifest was received.

E. Any shipment or part of a shipment for which acknowledgment is not received within the times set forth in this section must:

1. be investigated by the shipper if the shipper has not received notification or receipt within 20 days after transfer
2. be traced and reported. The investigation must include tracing the shipment and filing a report with the nearest Commission Regional Office listed in Appendix 19-5. Each licensee who conducts a trace investigation must file a written report with the appropriate NRC Regional Office within 2 weeks of completion of the investigation.



### Addendum 19-3

## Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests (10 CFR 20, Appendix G)

### I. Manifests

A waste generator, collector, or processor who transports, or offers for transportation, low-level radioactive waste intended for ultimate disposal at a licensed low-level radioactive waste land disposal facility must prepare a manifest (OMB Control Number 3150-0164, -0165, and -0166) reflecting information requested on applicable NRC Forms 540 (Uniform Low-Level Radioactive Waste Manifest (Shipping Paper)) and 541 (Uniform Low-Level Radioactive Waste Manifest (Container and Waste Description)) and, if necessary, on an applicable NRC Form 542 (Uniform Low-Level Radioactive Waste Manifest (Manifest Index and Regional Compact Tabulation)). NRC Forms 540 and 540A must be completed and must physically accompany the pertinent low-level waste shipment. Upon agreement between shipper and consignee, NRC Forms 541 and 541A and 542 and 542A may be completed, transmitted, and stored in electronic media with the capability for producing legible, accurate, and complete records on the respective forms. Licensees are not required by NRC to comply with the manifesting requirements of this part when they ship:

- (a) LLW for processing and expect its return (i.e., for storage under their license) prior to disposal at a licensed land disposal facility;
- (b) LLW that is being returned to the licensee who is the "waste generator" or "generator" as defined in this part; or
- (c) radioactively contaminated material to a "waste processor" that becomes the processor's "residual waste."

For guidance in completing these forms, refer to the instructions that accompany the forms. Copies of manifests required by this addendum may be legible carbon copies, photocopies, or computer printouts that reproduce the data in the format of the uniform manifest.

NRC Forms 540, 540A, 541, 541A, 542, and 542A, and the accompanying instructions, in hard copy, may be obtained from the Information and Records Management Branch, Office of Information Resources Management, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone (301)415-7232.

This addendum includes information requirements of the Department of Transportation, as codified in 49 CFR part 172. Information on hazardous, medical, or other waste, required to meet Environmental Protection Agency regulations, as codified in 40 CFR parts 259, 261, or elsewhere, is not addressed in this section, and must be provided on the required EPA forms. However, the required EPA forms must accompany the Uniform Low-Level Radioactive Waste Manifest required by this chapter.

As used in this addendum, the following definitions apply:

*Chelating agent* means amine polycarboxylic acids (e.g., EDTA, DPTA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carboic acid, and glucinic acid).

*Chemical description* means a description of the principal chemical characteristics of a low-level radioactive waste.

*Computer-readable medium* means that the regulatory agency's computer can transfer the information from the medium into its memory.

*Consignee* means the designated receiver of the shipment of low-level radioactive waste.

*Decontamination facility* means a facility operating under a Commission or Agreement State license whose principal purpose is decontamination of equipment or materials to accomplish recycle, reuse, or other waste management objectives, and, for purposes of 10 CFR 20, is not considered to be a consignee for LLW shipments.

*Disposal container* means a container principally used to confine low-level radioactive waste during disposal operations at a land disposal facility (also see "high integrity container"). Note that, for some shipments, the disposal container may be the transport package.

*EPA identification number* means the number received by a transporter following application to the Administrator of EPA as required by 40 CFR part 263.

*Generator* means a licensee operating under a Commission or Agreement State license who (1) is a waste generator as defined in 10 CFR 20, or (2) is the licensee to whom waste can be attributed within the context of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (e.g., waste generated as a result of decontamination or recycle activities).

*High integrity container (HIC)* means a container commonly designed to meet the structural stability requirements of 10 CFR 61.56, and to meet Department of Transportation requirements for a Type A package.

*Land disposal facility* means the land, buildings and structures, and equipment which are intended to be used for the disposal of radioactive wastes.

*NRC Forms 540, 540A, 541, 541A, 542, and 542A* are official NRC Forms referenced in this addendum. Licensees need not use originals of these NRC Forms as long as any substitute forms are equivalent to the original documentation in respect to content, clarity, size, and location of information. Upon agreement between the shipper and consignee, NRC Forms 541 (and 541A) and NRC Forms 542 (and 542A) may be completed, transmitted, and stored in electronic media. The electronic media must have the capability for producing legible, accurate, and complete records in the format of the uniform manifest.

*Package* means the assembly of components necessary to ensure compliance with the packaging requirements of DOT regulations, together with its radioactive contents, as presented for transport.

*Physical description* means the items called for on NRC Form 541 to describe a low-level radioactive waste.

*Residual waste* means low-level radioactive waste resulting from processing or decontamination activities that cannot be easily separated into distinct batches attributable to specific waste generators. This waste is attributable to the process or decontamination facility, as applicable.

*Shipper* means the licensed entity (i.e., the waste generator, waste collector, or waste processor) who offers low-level radioactive waste for transportation, typically consigning this type of waste to a licensed waste collector, waste processor, or land disposal facility operator.

*Shipping paper* means NRC Form 540 and, if required, NRC Form 540A which includes the information required by DOT in 49 CFR part 172.

*Source material* means (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material.

*Special nuclear material* means (1) Plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 of the Act, determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing.

*Uniform Low-Level Radioactive Waste Manifest or uniform manifest* means the combination of NRC Forms 540, 541, and, if necessary, 542, and their respective continuation sheets as needed, or equivalent.

*Waste collector* means an entity, operating under a Commission or Agreement State license, whose principal purpose is to collect and consolidate waste generated by others, and to transfer this waste, without process or repackaging the collected waste, to another licensed waste collector, licensed waste processor, or licensed land disposal facility.

*Waste description* means the physical, chemical, and radiological description of a low-level radioactive waste as called for on NRC Form 541.

*Waste generator* means an entity, operating under a Commission or Agreement State license, who (1) possesses any material or component that contains radioactivity or is radioactively contaminated for which the licensee foresees no further use, and (2) transfers this material or component to a licensed land disposal facility or to a licensed waste collector or processor for handling or treatment prior to disposal. A licensee performing processing or decontamination services may be a "waste generator" if the transfer of low-level radioactive waste from its facility is defined as "residual waste."

*Waste processor* means an entity, operating under a Commission or Agreement State license, whose principal purpose is to process, repackage, or otherwise treat low-level radioactive waste or waste generated by others prior to eventual transfer of waste to a licensed low-level radioactive waste land disposal facility.

*Waste type* means a waste within a disposal container having a unique physical description (i.e., a specific waste descriptor code or description; or a waste sorbed on or solidified in a specifically defined media.)

## *Information Requirements*

### A. General Information

The shipper of the radioactive waste shall provide the following information on the uniform manifest:

1. The name, facility address, and telephone number of the licensee shipping the waste;
2. An explicit declaration indicating whether the shipper is acting as a waste generator, collector, processor, or a combination of these identifiers for purposes of the manifested shipment; and
3. The name, address, and telephone number, or the name and EPA identification number for the carrier transporting the waste.

### B. Shipment Information

The shipper of the radioactive waste shall provide the following information regarding the waste shipment on the uniform manifest:

1. The date of the waste shipment;
2. The total number of packages/disposal containers;
3. The total disposal volume and disposal weight in the shipment;
4. The total radionuclide activity in the shipment;
5. The activity of each of the radionuclides H-3, C-14, Tc-99, and I-129 contained in the shipment; and
6. The total masses of U-233, U-235, and plutonium in special nuclear material, and the total mass of uranium and thorium in source material.

### C. Disposal Container and Waste Information

The shipper of the radioactive waste shall provide the following information on the uniform manifest regarding the waste and each disposal container of waste in the shipment:

1. An alphabetic or numeric identification that uniquely identifies each disposal container in the shipment;
2. A physical description of the disposal container, including the manufacturer and model of any high integrity container;
3. The volume displaced by the disposal container;
4. The gross weight of the disposal container, including the waste;
5. For waste consigned to a disposal facility, the maximum radiation level at the surface of each disposal container;
6. A physical and chemical description of the waste;
7. The total weight percentage of chelating agent for any waste containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;
8. The approximate volume of waste within a container;
9. The sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name;
10. The identities and activities of individual radionuclides contained in each container, the masses of U-233, U-235, and plutonium in special nuclear material, and the masses of uranium and thorium in source material. For discrete waste types (i.e., activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides associated with or contained on these waste types within a disposal container shall be reported;
11. The total radioactivity within each container; and
12. For wastes consigned to a disposal facility, the classification the waste pursuant to 10 CFR 61.55. Waste not meeting the structural stability requirements of 10 CFR 61.56(b) must be identified.

### D. Uncontainerized Waste Information

The shipper of the radioactive waste shall provide the following information on the uniform manifest regarding a waste shipment delivered without a disposal container:

1. The approximate volume and weight of the waste;
2. A physical and chemical description of the waste;

3. The total weight percentage of chelating agent if the chelating agent exceeds 0.1% by weight, plus the identity of the principal chelating agent;
4. For waste consigned to a disposal facility, the classification of the waste pursuant to 10 CFR 61.55. Waste not meeting the structural stability requirements of 10 CFR 61.56(b) must be identified.
5. The identities and activities of individual radionuclides contained in the waste, the masses of U-233, U-235, and plutonium in special nuclear material; and
6. For wastes consigned to a disposal facility, the maximum radiation levels at the surface of the waste.

#### E. Multi-Generator Disposal Container Information

This section applies to disposal containers enclosing mixtures of waste originating from different generators. (Note: The origin of the LLW resulting from a processor's activities may be attributable to one or more "generators" (including "waste generators")). It also applies to mixtures of wastes shipped in an uncontainerized form, for which portions of the mixture within the shipment originate from different generators.

1. For homogeneous mixtures of waste, such as incinerator ash, provide the waste description applicable to the mixture and the volume of waste attributed to each generator.
2. For homogeneous mixtures of waste, such as the combined products from a large compactor, identify each generator contributing waste to the disposal container, and, for discrete waste types (i.e., activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides associated with or contained on these waste types within the disposal container. For each generator, provide the following:
  - (a) The volume of waste within the disposal container;
  - (b) A physical and chemical description of the waste, including the solidification agent, if any;
  - (c) The total weight percentage of chelating agents for any disposal container containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;
  - (d) The sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name if the media is claimed to meet stability requirements in 10 CFR 61.56(b); and
  - (e) Radionuclide identities and activities contained in the waste, the masses of U-233, U-235, and plutonium in special nuclear material, and the masses of uranium and thorium in source material if contained in the waste.

## II. Certification

An authorized representative of the waste generator, processor, or collector shall certify by signing and dating the shipment manifest that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and the Commission. A collector in signing the certification is certifying that nothing has been done to the collected waste which would invalidate the waste generator's certification.

## III. Control and Tracking

A. Any licensee who transfers radioactive waste to a land disposal facility or a licensed waste collector shall comply with the requirements in paragraphs A.1 through A.9 of this section. Any licensee who transfers waste to a licensed waste processor for waste treatment or repackaging shall comply with the requirements in paragraphs A.4 through A.9 of this section. All licensees shall:

1. Prepare all wastes so that the waste is classified according to 10 CFR 61.55 and meets the waste characteristics requirement in 10 CFR 61.56;
2. Label each disposal container (or transport package if potential radiation hazards preclude labeling of the individual disposal container) of waste to identify whether it is Class A waste, Class B waste, or Class C waste, or greater than Class C waste, in accordance with 10 CFR 61.55;
3. Conduct a quality assurance program to ensure compliance with 10 CFR 61.55 and 61.56 (the program must include management evaluation of audits);

4. Prepare the NRC Uniform Low-Level Radioactive Waste Manifest as required by this addendum;
5. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either (i) the receipt of the manifest precedes the LLW shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;
6. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment, regardless of the option chosen in paragraph A.5 of this section;
7. Receive acknowledgment of the receipt of the shipment in the form of a signed copy of NRC Form 540;
8. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 10 CFR 30, 40, and 70; and
9. For any shipments or any part of a shipment for which acknowledgment has not been received within the times set forth in this addendum, conduct an investigation in accordance with paragraph E of this addendum.

B. Any waste collector licensee who handles only prepackaged waste shall:

1. Acknowledge receipt of the waste from the generator within 1 week of receipt by returning a signed copy of NRC Form 540;
2. Prepare a new manifest to reflect consolidated shipments that meet (*sic*) the requirements of this addendum. [NOTE: It is the manifest that should meet the requirements of this addendum, not consolidated shipments.] The waste collector shall ensure that, for each container of waste in the shipment, the manifest identifies the generator of that container of waste;
3. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either (i) Receipt of the manifest precedes the LLW shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;
4. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment, regardless of the option chosen in paragraph B.3 of this section;
5. Receive acknowledgment of the receipt of the shipment in the form of a signed copy of NRC Form 540;
6. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 10 CFR 30, 40, and 70;
7. For any shipments or any part of a shipment for which acknowledgment has not been received within the times set forth in this addendum, conduct an investigation in accordance with paragraph E of this addendum; and
8. Notify the shipper and the Administrator of the nearest Commission Regional Office listed in Appendix 19-5 when any shipment or part of a shipment has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been cancelled.

C. Any licensed waste processor who treats or repackages waste shall:

1. Acknowledge receipt of the waste from the shipper within 1 week of receipt by returning a signed copy of the NRC Form 540;
2. Prepare a new manifest that meets the requirements of this addendum. Preparation of the new manifest reflects that the processor is responsible for meeting these requirements. For each container of waste in the shipment, the manifest shall identify the waste generators, the preprocessed waste volume, and other information as required in paragraph I.E of this addendum;
3. Prepare all wastes so that the waste is classified according to 10 CFR 61.55 and meets the waste characteristics requirements in 10 CFR 61.56;
4. Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with 10 CFR 61.55 and 61.57;
5. Conduct a quality assurance program to ensure compliance with 10 CFR 61.55 and 61.56 (the program shall include management evaluation of audits);
6. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either (i) Receipt of the manifest precedes the LLW shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;

ered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;

7. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment, regardless of the option chosen in paragraph B.3 of this section;
8. Receive acknowledgment of the receipt of the shipment in the form of a signed copy of NRC Form 540;
9. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 10 CFR 30, 40, and 70;
10. For any shipments or any part of a shipment for which acknowledgment has not been received within the times set forth in this addendum, conduct an investigation in accordance with paragraph E of this addendum; and
11. Notify the shipper and the Administrator of the nearest Commission Regional Office listed in Appendix 19-5 when any shipment or part of a shipment has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been cancelled.

D. The land disposal facility operator must:

1. Acknowledge receipt of waste within 1 week of receipt by returning, as a minimum, a signed copy of NRC Form 540 to the shipper. The shipper to be notified is the licensee who last possessed the waste and transferred the waste to the operator. If any discrepancy exists between materials listed on the Uniform Low-Level Radioactive Waste Manifest and materials received, copies or electronic transfer of the affected forms must be returned indicating the discrepancy;
2. Maintain copies of all completed manifests and electronically store the information required by 10 CFR 61.80(l) until the Commission terminates the license; and
3. Notify the shipper and the Administrator of the nearest Commission Regional Office (see Appendix 19-5) when any shipment or part of a shipment has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been cancelled.

E. Any shipment or part of a shipment for which acknowledgment is not received within the times set forth in this section must:

1. Be investigated by the shipper if the shipper has not received notification or receipt within 20 days after transfer; and
2. Be traced and reported. The investigation shall include tracing the shipment and filing a report with the nearest Commission Regional Office listed in Appendix 19-5. Each licensee who conducts a trace investigation must file a written report with the appropriate NRC Regional Office within 2 weeks of completion of the investigation.

<sup>1</sup> The quantities listed above were derived by taking one tenth of the most restrictive ALI listed in Appendix B to 10 CFR 20, rounding to the nearest factor of 10, and arbitrarily constraining the values listed between 0.001 and 1000  $\mu\text{Ci}$ . Values of 100  $\mu\text{Ci}$  have been assigned for radionuclides having a radioactive half-life in excess of  $10^9$  years (except rhodium, 1000  $\mu\text{Ci}$ ) to take into account their low specific activity.

(NOTE: For purposes of 10 CFR 20.1902(e), 20.1905(a), and 20.2201(a) where there is involved a combination of radionuclides in known amounts, the limit for the combination should be derived as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide when not in combination. The sum of such ratios for all radionuclides in the combination may not exceed "1" (i.e., "unity").)



## **CHAPTER 20**

### **NONIONIZING RADIATION**

## CHAPTER 20

### EOH: NONIONIZING RADIATION

#### ECAMP-ANG

September 1997

#### Applicability

The requirements of this chapter apply to all radiation originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radio navigation, and industrial and scientific purposes. They do not apply to the deliberate exposure of patients by, or under the direction of, practitioners of the healing arts.

#### Compliance Definitions

- *Electromagnetic Radiation* - that portion of the spectrum commonly defined as the radio frequency region, including the microwave frequency (29 CFR 1910.97(a)(1)(i)).
- *Partial Body Irradiation* - pertains to the case in which part of the body is exposed to the incident electromagnetic energy (29 CFR 1910.97(a)(1)(ii)).
- *Radiation Protection Guide* - radiation level which should not be exceeded without careful consideration for doing so (29 CFR 1910.97(a)(1)(iii)).
- *Whole Body Irradiation* - pertains to the case in which the entire body is exposed to the incident electromagnetic energy or in which the cross section of the body is smaller than the cross section of the incident radiation beam (29 CFR 1910.97(a)(v)).



**EOH: NONIONIZING RADIATION**  
**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	NR.10.1 and NR.10.2	20-5



**COMPLIANCE CATEGORY**  
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<p><b>NR.10</b>  <b>GENERAL REQUIREMENTS</b></p> <p><b>NR.10.1.</b> Installations must use a prescribed radiation protection guide for normal environmental conditions and certain frequencies of incident electromagnetic energy (29 CFR 1910.97 (a)(2)).</p> <p><b>NR.10.2.</b> Warning symbols for radio frequency radiation hazards must meet specific requirements (29 CFR 1910.97(a)(3)).</p>	<p>Verify that the installation uses 10 mW/cm<sup>2</sup> as averaged over any possible 0.1-h period as the radiation protection guide for:</p> <ul style="list-style-type: none"> <li>- normal environmental conditions</li> <li>- incident electromagnetic energy of frequencies from 10 MHz to 100 Ghz.</li> </ul> <p>(NOTE: This means the following:</p> <ul style="list-style-type: none"> <li>- power density: 10 mW/cm<sup>2</sup> for periods of 0.1 h or more</li> <li>- energy density: 1 mW-h/cm<sup>2</sup> during any 0.1-h period.)</li> </ul> <p>(NOTE: This guide applies to both continuous and intermittent radiation and pertains to whole body and partial body irradiation.)</p> <p>Verify that: the warning symbol for radio frequency radiation hazards consist of a red isosceles triangle above an inverted black isosceles triangle, separated and outlined by an aluminum color border.</p> <p>Verify that: the following words are displayed in the upper triangle of the symbol:</p> <p style="text-align: center;"><b>WARNING</b>  <b>RADIO-FREQUENCY RADIATION HAZARD.</b></p> <p>Verify that the installation uses ANSI Z53.1-1953, <i>Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment</i>, and that all lettering and the border on the symbol are of aluminum color.</p> <p>Verify that, if other warning information is included on the symbol, it appears in the lower triangle.</p> <p>(NOTE: The regulations do not explicitly state the circumstances under which warning symbols are required.)</p>



## **CHAPTER 21**

### **VENTILATION**

## CHAPTER 21

### EOH: VENTILATION

#### ECAMP-ANG

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#### Compliance Definitions

- *Abrasive* - a solid substance used in an abrasive blasting operation (29 CFR 1910.94(a)(1)(i)).
- *Abrasive Blasting* - the forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force (29 CFR 1910.94(a)(1)(xii)).
- *Abrasive Blasting Respirator* - a continuous flow air-line respirator constructed so that it will cover the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive (29 CFR 1910.94 (a)(1)(ii)).
- *Belts* - all power-driven, flexible, coated bands used for grinding, polishing, or buffing purposes (29 CFR 1910.94(b)(1)(ii)).
- *Blast Cleaning Barrel* - a complete enclosure that rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray (29 CFR 1910.94(a)(1)(iii)).
- *Blasting Cabinet* - an enclosure in which the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure (29 CFR 1910.94(a)(1)(v)).
- *Branch Pipe* - the part of an exhaust system piping that is connected directly to the hood or enclosure (29 CFR 1910.94(b)(1)(iii)).
- *Clean Air* - air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time (29 CFR 1910.94(a)(1)(vi)).
- *Dust Collector* - a device or combination of devices for separating dust from the air handled by an exhaust ventilation system (29 CFR 1910.94(a)(1)(vii)).
- *Exhaust System* - for grinding, polishing, and buffing operations, a system consisting of branch pipes connected to hoods or enclosures, one or more header pipes, an exhaust fan, means for separating solid contaminants from the air flowing in the system, and a discharge stack to outside (29 CFR 1910.94(b)(1)(vii)).
- *Header Pipe (Main Pipe)* - a pipe into which one or more branch pipes enter and which connects such branch pipes to the remainder of the exhaust system (29 CFR 1910.94(b)(1)(ix)).
- *Hoods and Enclosures* - the partial or complete enclosure around the wheel or disc through which air enters an exhaust system during operation (29 CFR 1910.94(b)(1)(x)).
- *Particulate-Filter Respirator* - an air purifying respirator, commonly referred to as a dust or a fume respirator, that removes most of the dust or fume from the air passing through the device (29 CFR 1910.94(a)(1)(ix)).
- *Respirable Dust* - airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages (29 CFR 1910.94(a)(1)(x)).

- *Rotary Blast Cleaning Table* - an enclosure in which the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays (29 CFR 1910.94(a)(1)(xi)).
- *Spray Finishing Operations* - the employment of methods wherein organic or inorganic materials are utilized in dispersed form for deposit on surfaces to be coated, treated, or cleaned. Such methods of deposit may involve either automatic, manual, or electrostatic deposition, but do not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems (29 CFR 1910.94(c)(1)(i)).
- *Spray Booth* - a power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue and to safely conduct or direct them to an exhaust system (29 CFR 1910.94(c)(1)(ii)).
- *Spray Room* - a room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas (29 CFR 1910.94(c)(1)(ii)).

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Abrasive Blasting	VN.10.1 through VN.10.12	21-5
Grinding, Polishing, and Buffing Operations	VN.20.1 through VN.20.2	21-9
Spray Finishing Operations	VN.30.1 through VN.30.2	21-11



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<p><b>VN.10</b>  <b>ABRASIVE</b>  <b>BLASTINGS</b></p> <p><b>VN.10.1.</b> The concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator or any other worker must be kept below certain levels (29 CFR 1910.94(a)(2)(ii)).</p> <p><b>VN.10.2.</b> Organic abrasives which are combustible may be used only in automatic systems (29 CFR 1910.94 (a)(2)(iii)).</p> <p><b>VN.10.3.</b> Certain requirements must be satisfied in areas where the presence of flammable or explosive dust mixtures is possible (29 CFR 1910.94 (a)(2)(iii)).</p> <p><b>VN.10.4.</b> The ventilation of blast-cleaning enclosures must meet specific requirements (29 CFR 1910.94 (a)(3)(i) and (a)(3)(i)(a) through (a)(3)(i)(c)).</p>	<p>(NOTE: The requirements in VN.10 apply to all operations where an abrasive is forcibly applied to a surface by pneumatic or hydraulic pressure, or by centrifugal force. These requirements do not apply to steam blasting, or steam cleaning, or hydraulic cleaning methods where work is done without the aid of abrasives.)</p> <p>Verify that the concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator or any other worker is kept below the levels specified in 29 CFR 1910.1000 (see the checklist items AC.10).</p> <p>(NOTE: The composition and toxicity of the dust from abrasives and the surface coatings on the materials blasted are to be taken into account when making an evaluation of the potential health hazards.)</p> <p>Verify that organic abrasives which are combustible are used only in automatic systems.</p> <p>Determine whether the presence of flammable or explosive dust mixtures is possible.</p> <p>Verify that the blast nozzle is bonded and grounded to prevent the build up of static charges.</p> <p>Verify that the following are constructed with loose panels or explosion venting areas:</p> <ul style="list-style-type: none"> <li>- the abrasive blasting enclosure</li> <li>- the ducts</li> <li>- the dust collector.</li> </ul> <p>Verify that such loose panels or venting is located on sides away from any occupied area.</p> <p>Verify that blast-cleaning enclosures are exhaust ventilated in such a way that a continuous inward flow of air is maintained at all openings in the enclosure during the blasting operation.</p> <p>Verify that all air inlets and access openings are baffled or so arranged that, by the combination of inward air flow and baffling, the escape of abrasive or dust particles into an adjacent work area is minimized and visible spurts of dust cannot be observed.</p>

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<p><b>VN.10.5.</b> The construction, installation, inspection, and maintenance of exhaust systems must meet specific requirements (29 CFR 1910.94(a)(4)(i) through (a)(4)(iii)).</p> <p><b>VN.10.6.</b> PPE used to protect personnel against dust produced during abrasive blasting operations must meet specific standards (29 CFR 1910.94(a)(5)(i)).</p> <p><b>VN.10.7.</b> Abrasive-blasting respirators must be worn by abrasive- blasting operators under certain circumstances (29 CFR 1910.94(a)(5)(ii) through (a)(5)(iii)(a)).</p>	<p>Verify that the rate of exhaust is sufficient to provide prompt clearance of the dust-laden air within the enclosure after the cessation of blasting.</p> <p>Verify that, before the enclosure is opened, the blast is turned off and the exhaust system runs for a sufficient period of time to remove the dusty air within the enclosure.</p> <p>Verify that the construction, installation, inspection, and maintenance of exhaust systems conforms to the principles and requirements set forth in <i>American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems</i>, Z9.2-1960, and ANSI Z33.1-1961.</p> <p>Verify that, when dust leaks are noted, repairs are made as soon as possible.</p> <p>Verify that the static pressure drop at the exhaust ducts leading from the equipment is checked when the installation is completed and periodically thereafter to assure continued satisfactory operation.</p> <p>Verify that, whenever an appreciable change in the pressure drop indicates a partial blockage, the system is cleaned and returned to normal operating condition.</p> <p>Verify that, in situations where the abrasive is recirculated, an abrasive separator is provided for the removal of fines from the spent abrasive.</p> <p>Verify that the air exhausted from blast-cleaning equipment is discharged through dust collecting equipment.</p> <p>Verify that dust collectors are set up so that the accumulated dust can be emptied and removed without contaminating other working areas.</p> <p>Verify that PPE used to protect personnel against dust produced during abrasive blasting operations has been approved by the Mine Safety and Health Administration (MSHA) and the NIOSH.</p> <p>Verify that abrasive-blasting respirators are worn by abrasive-blasting operators under the following conditions:</p> <ul style="list-style-type: none"> <li>- when working inside of blast-cleaning rooms</li> <li>- when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure</li> <li>- where concentrations of toxic dust dispersed by the abrasive blasting may exceed the limits set in 29 CFR 1910.1000 (see the checklist items in</li> </ul>

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<p><b>VN.10.8.</b> Dust-filter respirators must not be used for continuous protection in certain circumstances (29 CFR 1910.94(a) (5)(iii)(b)).</p> <p><b>VN.10.9.</b> A respiratory protection program that meets specific requirements must be established under certain circumstances (29 CFR 1910.94(a)(5)(iv)).</p> <p><b>VN.10.10.</b> Operators of abrasive blasting equipment must wear protective clothing that meets specific requirements (29 CFR 1910.94(a)(5)(v)).</p> <p><b>VN.10.11.</b> The air for abrasive-blasting respirators must meet specific requirements (29 CFR 1910.94(a)(5)(v)).</p>	<p>AC.10) and the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure.</p> <p>(NOTE: Properly fitted particulate filter respirators (commonly referred to as dust-filter respirators), that have been approved for protection against the specific type of dust encountered, may be used for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point, when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means.)</p> <p>(NOTE: Dust-filter respirators may be used to protect the operator of outside abrasive-blasting operations where nonsilica abrasives are used on materials having low toxicities.)</p> <p>Verify that dust-filter respirators are not used for continuous protection:</p> <ul style="list-style-type: none"> <li>- where silica sand is used as the blasting abrasive</li> <li>- where toxic materials are blasted.</li> </ul> <p>Determine whether it is necessary to use respiratory-protective equipment in connection with abrasive blasting operations on the installation.</p> <p>Verify that there is a respiratory protection program if the use of such equipment is necessary.</p> <p>Verify that the program meets the requirements of 29 CFR 1910.134(a) and 1910.134(b) (see checklist items PE.30.1, PE.30.2, PE.30.4, PE.30.9, PE.40.3, PE.70.2, PE.80.1, PE.100.3, and PE.100.5).</p> <p>Verify that operators are equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives.</p> <p>Verify that equipment for protection of the eyes and face is supplied to the operator when the respirator design does not provide such protection, and to any other personnel working in the vicinity of abrasive blasting operations.</p> <p>Verify that equipment for the eye and face conforms to the requirements of 29 CFR 1910.133 (see the checklist items in PE.20).</p> <p>Verify that the air for abrasive-blasting respirators is free of harmful quantities of dusts, mists, or noxious gases.</p> <p>Verify that the air meets the requirements for air purity set forth in ANSI Z9.2-1960.</p>

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<p><b>VN.10.12.</b> Specific house-keeping standards must be met where abrasive blasting operations are carried out (29 CFR 1910.94(a)(5)(v)).</p>	<p>(NOTE: The air from the regular compressed air line of the plant may be used for the abrasive-blasting respirator if all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>- a trap and carbon filter are installed and regularly maintained to remove oil, water, scale, and odor</li> <li>- a pressure reducing diaphragm or valve is installed to reduce the pressure down to requirements of the particular type of abrasive-blasting respirator</li> <li>- an automatic control is provided to either sound an alarm or shut down the compressor in case of overheating.)</li> </ul> <p>Verify that dust is not allowed to accumulate on the floor or on ledges outside of abrasive-blasting enclosures.</p> <p>Verify that dust spills are cleaned up promptly.</p> <p>Verify that aisles and walkways are kept clear of steel shot or similar abrasive which may create a slipping hazard.</p>

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<p><b>VN.20</b>  <b>GRINDING, POLISHING, AND BUFFING OPERATIONS</b></p> <p><b>VN.20.1.</b> A local exhaust ventilation system must be both provided and used under certain conditions (29 CFR 1910.94(b)(2)).</p> <p><b>VN.20.2.</b> Installations must meet specific requirements with regard to hoods connected to exhaust systems (29 CFR 1910.94(b)(3)).</p>	<p>Verify that a local exhaust ventilation system is both provided and used wherever dry grinding, dry polishing, or buffing is performed, and personnel exposure, without regard to the use of respirators, exceeds the occupational/permissible exposure limits prescribed in 29 CFR 1910.1000 or other sections of 29 CFR (see the checklist items in AC.10 for the requirements of 29 CFR 1910.1000).</p> <p>Verify that hoods connected to exhaust systems are used.</p> <p>Verify that such hoods are designed, located, and placed so that the dust or dirt particles fall or are projected into the hoods in the direction of the air flow.</p> <p>Verify that wheels, discs, straps, or belts are operated in such manner and in such direction as to prevent the dust and dirt particles from being thrown into the operator's breathing zone.</p>



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<p><b>VN.30</b>  <b>SPRAY FINISHING OPERATIONS</b></p> <p><b>VN.30.1.</b> Spray booths or spray rooms are to be used to enclose or confine all operations (29 CFR 1910.94 (c)(2)).</p> <p><b>VN.30.2.</b> Clean fresh air must be provided to spray booths or rooms in appropriate quantities (29 CFR 1910.94 (c)(7)).</p> <p><b>VN.30.3.</b> The BE must take into account information contained in MSDSs when selecting the proper respirator (MP).</p>	<p>(NOTE: The requirements in VN.30 do not apply to the spraying of the exteriors of buildings, fixed tanks, or similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.)</p> <p>Verify that spray booths or spray rooms are to be used to enclose or confine all spray finishing operations.</p> <p>Verify that clean, fresh air, free of contamination from adjacent industrial exhaust systems, chimneys, stacks, or vents, is supplied to spray booths or rooms in quantities equal to the volume of air exhausted through the spray booth.</p> <p>Verify that the BE has, in selecting the proper respirator, taken into account the information contained in the MSDSs for the material being sprayed.</p> <p>(NOTE: For further respiratory protection requirements, see Section G of the chapter on Environmental/Occupational Health.)</p>



## **CHAPTER 22**

### **SPRAY FINISHING**

## CHAPTER 22

### EOH: SPRAY FINISHING

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#### Applicability

This chapter applies to flammable and combustible finishing materials when applied as a spray by:

1. compressed air
2. "airless" or "hydraulic atomization"
3. steam
4. electrostatic methods
5. any other means in continuous or intermittent processes.

The chapter also covers the application of combustible powders by:

1. powder spray guns
2. electrostatic powder spray guns
3. fluidized beds
4. electrostatic fluidized beds.

The chapter does not apply to outdoor spray application of buildings, tanks, or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

#### Compliance Definitions

- *Aerated Solid Powders* - any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations (29 CFR 1910.107(a)(1)).
- *Approved* - approved and listed by a nationally recognized testing laboratory (see definition in 29 CFR 1910.7) (29 CFR 1910.107(a)(8)).
- *Dry Spray Booth* - a spray booth not equipped with a water washing system as described in the definition of *Water Spray Booth*. A dry spray booth may be equipped with either (29 CFR 1910.107(a)(5)):
  - (i) distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct
  - (ii) overspray dry filters to minimize dusts
  - (iii) overspray dry filters to minimize dusts or residues entering exhaust ducts
  - (iv) overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts
  - (v) powder collection systems so arranged in the exhaust to capture oversprayed material, where dry powders are being sprayed.
- *Electrostatic Fluidized Bed* - a container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported, through the container immediately above the charged and aerated materials in order to be coated (29 CFR 1910.107(a)(7)).

- *Fluidized Bed* - a container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported (29 CFR 1910.107(a)(6)).
- *Listed* - See *approved* (29 CFR 1910.107(a)(9)).
- *Spray Booth* - a power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system (29 CFR 1910.107(a)(3)).
- *Spraying Area* - any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes (29 CFR 1910.107(a)(2)).
- *Waterwash Spray Booth* - a spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material (29 CFR 1910.107(a)(4)).

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Spray Booths	SF.10.1 through SF.10.10	22-5
Electrical and Other Sources of Ignition	SF.20.1 through SF.20.7	22-9
Ventilation	SF.30.1 through SF.30.10	22-11
Flammable and Combustible Liquids: Storage and Handling	SF.40.1 through SF.40.7	22-15
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Operation and Maintenance	SF.60.1 through SF.60.7	22-21
Fixed Electrode Apparatus	SF.70.1 through SF.70.9	22-23
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Drying, Curing, or Fusion Apparatus	SF.90.1 through SF.90.3	22-29
Automobile Undercoating in Garages	SF.100.1	22-31
Powder Coating	SF.110.1 through SF.110.7	22-33
Organic Peroxides and Other Dual Component Coatings	SF.120.1 and SF.120.2	22-37

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<p><b>SF.10</b>  <b>SPRAY BOOTHS</b></p> <p><b>SF.10.1.</b> Spray booths must be constructed in accordance with certain requirements (29 CFR 1910.107(b)(1)).</p> <p><b>SF.10.2.</b> The interior surfaces of spray booths must meet specific design requirements (29 CFR 1910.107(b)(2)).</p> <p><b>SF.10.3.</b> Combustible floors must be covered (29 CFR 1910.107(b)(3)).</p> <p><b>SF.10.4.</b> Certain distribution and baffle plates must comply with specific requirements (29 CFR 1910.107(b)(4)).</p> <p><b>SF.10.5.</b> Exhaust air filters in dry type overspray collectors must conform to certain requirements (29 CFR 1910.107(b)(5)).</p>	<p>Verify that spray booths are substantially constructed of either:</p> <ul style="list-style-type: none"> <li>- steel, securely and rigidly supported</li> <li>- concrete or masonry.</li> </ul> <p>(NOTE: Aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying.)</p> <p>Verify that spray booths are designed to sweep air currents toward the exhaust outlet.</p> <p>Verify that the interior surfaces of spray booths are both:</p> <ul style="list-style-type: none"> <li>- smooth and continuous without edges</li> <li>- otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.</li> </ul> <p>Verify that the floor surface of a spray booth and operator's working area, if combustible, is covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.</p> <p>Determine whether distribution or baffle plates are installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct.</p> <p>Verify that such distribution or baffle plates are of noncombustible material and readily removable or accessible on both sides for cleaning.</p> <p>Verify that no such plates are located in exhaust ducts.</p> <p>Determine whether overspray dry filters or filter rolls are installed in conventional dry type spray booths.</p> <p>Verify that such overspray dry filters or filter rolls conform to the following requirements in this checklist item.</p> <p>Verify that the spraying operations are designed, installed, and maintained so that the average air velocity over the open face of the booth (or booth cross section during spraying operations) is not less than 100 linear ft/min.</p>

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	<p>(NOTE: This requirement does not apply to electrostatic spraying operations.)</p> <p>(NOTE: Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear ft/min, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics.)</p> <p>Verify that one of the following is installed to indicate or ensure that the required air velocity is maintained:</p> <ul style="list-style-type: none"> <li>- visible gauges</li> <li>- an audible alarm</li> <li>- pressure activated devices.</li> </ul> <p>Verify that filter rolls are inspected to ensure proper replacement of filter media.</p> <p>Verify that all discarded filter pads and filter rolls are either:</p> <ul style="list-style-type: none"> <li>- immediately removed to a safe, well-detached location</li> <li>- placed in a water-filled metal container and disposed of at the close of the day's operation.</li> </ul> <p>(NOTE: This requirement to dispose of the pads and rolls at the close of the day's operation does not apply if they are maintained completely in water.)</p> <p>Verify that filters in a spray booth are located so as to not reduce the effective booth enclosure of the articles being sprayed.</p> <p>Verify that space within the spray booth on the downstream and upstream sides of filters is protected with approved automatic sprinklers.</p> <p>Verify that no filters or filter rolls are used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.</p> <p>Verify that clean filters and filter rolls are either:</p> <ul style="list-style-type: none"> <li>- noncombustible</li> <li>- of a type having a combustibility not in excess of class 2 filters as listed by Underwriters' Laboratories, Inc.</li> </ul> <p>Verify that filters and filter rolls are not alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition.</p>

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<p><b>SF.10.6.</b> Certain spray booths must have a deflector or curtain over the frontal opening (29 CFR 1910.107(b)(6)).</p> <p><b>SF.10.7.</b> Conveyor openings must be as small as practical (29 CFR 1910.107(b)(7)).</p> <p><b>SF.10.8.</b> Spray booths must be separated from other operations (29 CFR 1910.107(b)(8)).</p> <p><b>SF.10.9.</b> Spray booths must comply with certain requirements so as to facilitate cleaning (29 CFR 1910.107(b)(9)).</p> <p><b>SF.10.10.</b> Transparent panels for illumination must comply with certain requirements (29 CFR 1910.107(b)(10)).</p>	<p>Determine whether the spray booth has a frontal area larger than 9 ft<sup>2</sup>.</p> <p>Verify that each such spray booth has a metal deflector or curtain not less than 2.5 in. deep installed at the upper outer edge of the booth over the opening.</p> <p>Verify that, where conveyors are arranged to carry work into or out of spray booths, the openings for the conveyors are as small as practical.</p> <p>Verify that each spray booth is separated from other operations by either:</p> <ul style="list-style-type: none"> <li>- not less than 3 ft</li> <li>- by such partition or wall as to reduce the danger from juxtaposition of hazardous operations.</li> </ul> <p>Verify that spray booths are installed so that all portions are readily accessible for cleaning.</p> <p>Verify that a clear space of not less than 3 ft on all sides is kept free from storage or combustible construction.</p> <p>Verify that, when spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units are used as a source of illumination.</p> <p>Verify that panels both:</p> <ul style="list-style-type: none"> <li>- effectively isolate the spraying area from the area in which the lighting unit is located</li> <li>- are of a noncombustible material of such a nature or so protected that breakage will be unlikely.</li> </ul> <p>Verify that panels are arranged so that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.</p>



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<p><b>SF.20</b>  <b>ELECTRICAL AND</b>  <b>OTHER SOURCES OF</b>  <b>IGNITION</b></p> <p><b>SF.20.1.</b> Open flames and spark production equipment must not be allowed in certain areas (29 CFR 1910.107(c)(2)).</p> <p><b>SF.20.2.</b> Hot surfaces must not be located in a spraying area where deposits of combustible residues may readily accumulate (29 CFR 1910.107(c)(3)).</p> <p><b>SF.20.3.</b> Wiring must conform to certain requirements (29 CFR 1910.107(c)(4)).</p> <p><b>SF.20.4.</b> Electrical equipment susceptible to combustible residue deposits must not be located in spraying areas (29 CFR 1910.107(c)(5)).</p>	<p>(NOTE: All electrical equipment, open flames and other sources of ignition must conform to the requirements of 29 CFR 1910.107(c) (see the checklist items in SF.20), except as follows:</p> <ul style="list-style-type: none"> <li>- electrostatic apparatus must conform to the requirements of 29 CFR 1910.107(h) and (i) (see the checklist items in SF.70 and SF.80)</li> <li>- drying, curing, and fusion apparatus must conform to the requirements of 29 CFR 1910.107(j) (see the checklist items in SF.90)</li> <li>- automobile undercoating spray operations in garages must conform to the requirements of 29 CFR 1910.107(k) (see the checklist items in SF.100)</li> <li>- powder coating equipment must conform to the requirements of 29 CFR 1910.107(l).)</li> </ul> <p>Verify that there is no open flame or spark producing equipment:</p> <ul style="list-style-type: none"> <li>- in any spraying area</li> <li>- within 20 ft thereof, unless separated by a partition.</li> </ul> <p>Verify that space-heating appliances, steampipes, or hot surfaces are not located in a spraying area where deposits of combustible residues may readily accumulate.</p> <p>Verify that electrical wiring and equipment both:</p> <ul style="list-style-type: none"> <li>- conforms to the requirements of 29 CFR 1910.107(c) (see the checklist items in SF.20)</li> <li>- is otherwise in accordance with subpart S of 29 CFR 1910.</li> </ul> <p>Determine whether deposits of combustible residues may readily accumulate on electrical equipment.</p> <p>Verify that no such electrical equipment is in any spraying area.</p> <p>(NOTE: This requirement does not apply if the electrical equipment is specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors.)</p> <p>(NOTE: This requirement does not apply to wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.)</p>

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<p><b>SF.20.5.</b> Electrical wiring located in spray areas must comply with certain requirements (29 CFR 1910.107(c)(6)).</p>	<p>Determine whether electrical wiring and equipment is both:</p> <ul style="list-style-type: none"> <li>- located in a spraying area</li> <li>- not subject to deposits of combustible residues.</li> </ul> <p>Verify that such wiring and equipment:</p> <ul style="list-style-type: none"> <li>- is of explosion-proof type approved for Class I, group D locations</li> <li>- otherwise conforms to the provisions of subpart S of 29 CFR 1910, for Class I, Division 1, Hazardous Locations.</li> </ul> <p>Determine whether electrical wiring, motors, and other equipment is both:</p> <ul style="list-style-type: none"> <li>- outside of but within 20 ft of any spraying area</li> <li>- not separated therefrom by partitions.</li> </ul> <p>Verify that such equipment does not produce sparks under normal operating conditions and otherwise conforms to the provisions of subpart S of 29 CFR 1910 for Class I, Division 2 Hazardous Locations.</p>
<p><b>SF.20.6.</b> Certain electric lamps must satisfy specific requirements (29 CFR 1910.107(c)(7) and (8)).</p>	<p>Determine whether electric lamps are both:</p> <ul style="list-style-type: none"> <li>- outside of, but within 20 ft of any spraying area</li> <li>- not separated from the spraying area by a partition.</li> </ul> <p>Verify that such electric lamps are:</p> <ul style="list-style-type: none"> <li>- totally enclosed to prevent the falling of hot particles</li> <li>- protected from mechanical injury by suitable guards or by location.</li> </ul> <p>Verify that portable electric lamps are not used in any spraying area during spraying operations.</p> <p>Verify that portable electric lamps, if used during cleaning or repairing operations, are of the type approved for hazardous Class I locations.</p>
<p><b>SF.20.7.</b> Metal parts must be grounded (29 CFR 1910.107(c)(9)).</p>	<p>Verify that all metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids are properly electrically grounded in an effective and permanent manner.</p>

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<p><b>SF.30</b> <b>VENTILATION</b></p> <p><b>SF.30.1.</b> Spraying areas must be have adequate mechanical ventilation (29 CFR 1910.107(d)(2)).</p> <p><b>SF.30.2.</b> Spray booths must have independent exhaust duct systems (29 CFR 1910.107(d)(3)).</p> <p><b>SF.30.3.</b> Fan components must comply with certain requirements (29 CFR 1910.107(d)(4)).</p>	<p>Verify that all spraying areas are provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life is not endangered.</p> <p>Verify that mechanical ventilation is kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.</p> <p>Verify that each spray booth has an independent exhaust duct system discharging to the exterior of the building.</p> <p>(NOTE: Multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 ft<sup>2</sup> may have a common exhaust.)</p> <p>Verify that, if more than one fan serves one booth, all fans are so interconnected that one fan cannot operate without all fans being operated.</p> <p>Verify that either:</p> <ul style="list-style-type: none"> <li>- the fan-rotating element is nonferrous or nonsparking</li> <li>- the casing consists of or is lined with nonferrous or nonsparking material.</li> </ul> <p>Verify that there is ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction.</p> <p>Verify that, in evaluating this clearance, necessary allowance is made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing.</p> <p>Verify that fan blades are mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded.</p> <p>(NOTE: It is preferable for the shaft to have bearings outside of the duct and booth.)</p> <p>Verify that all bearings are either:</p> <ul style="list-style-type: none"> <li>- of the self-lubricating type</li> <li>- lubricated from the outside duct.</li> </ul>

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<b>SF.30.4.</b> Electric motors driving exhaust fans must not be placed inside booths or ducts (29 CFR 1910.107(d)(5)).	Verify that electric motors driving exhaust fans are not placed inside booths or ducts.
<b>SF.30.5.</b> Belts must not enter the duct or booth (29 CFR 1910.107(d)(6)).	Verify that belts do not enter the duct or booth.  (NOTE: This requirement does not apply when the belt and pulley within the duct or booth are thoroughly enclosed.)
<b>SF.30.6.</b> Exhaust ducts must satisfy certain requirements (29 CFR 1910.107(d)(7) and (10)).	Verify that exhaust ducts are:  <ul style="list-style-type: none"> <li>- constructed of steel</li> <li>- substantially supported.</li> </ul> (NOTE: Exhaust ducts without dampers are preferred.)  Verify that, if dampers are installed, they are maintained so that they will be in a full open position at all times the ventilating system is in operation.  Verify that exhaust ducts are protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 in.  (NOTE: If combustible construction is provided with the following protection applied to all surfaces within 18 in., clearances may be reduced to the distances indicated: <ul style="list-style-type: none"> <li>- 28-gage sheet metal on 0.25-in. asbestos mill board -- 12 in.</li> <li>- 28-gage sheet metal on 0.125-in. asbestos mill board spaced out 1 in. on noncombustible spacers -- 9 in.</li> <li>- 22-gage sheet metal on 1-in. rockwool batts reinforced with wire mesh or the equivalent -- 3 in.)</li> </ul> (NOTE: Where ducts are protected with an approved automatic sprinkler system, that is properly maintained, the clearance to combustible materials may be reduced to 6 in.)  Verify that, when necessary to facilitate cleaning, exhaust ducts are provided with an ample number of access doors.

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<b>SF.30.7.</b> Spray booth exhaust duct terminals must maintain certain discharge clearances (29 CFR 1910.107(d)(8)).	Verify that the terminal discharge point is not less than 6 ft from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 ft.  (NOTE: This requirement does not apply if the spray booth exhaust duct terminal is from a water-wash spray booth.)
<b>SF.30.8.</b> Air exhaust must satisfy certain requirements (29 CFR 1910.107(d)(9)).	Verify that air exhaust from spray operations is not directed:  <ul style="list-style-type: none"> <li>- so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes</li> <li>- so as to create a nuisance.</li> </ul>
<b>SF.30.9.</b> Room intakes must satisfy certain requirements (29 CFR 1910.107(d)(11)).	Verify that air exhausted from spray operations is not recirculated.  Verify that air intake openings to rooms containing spray finishing operations are:  <ul style="list-style-type: none"> <li>- adequate for the efficient operation of exhaust fans</li> <li>- so located as to minimize the creation of dead air pockets.</li> </ul>
<b>SF.30.10.</b> Drying spaces must comply with certain requirements (29 CFR 1910.107(d)(12)).	Verify that freshly sprayed articles are dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors.  Verify that, in the event adequate and reliable ventilation is not provided, such drying spaces are considered a spraying area.



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<p><b>SF.40</b>  <b>FLAMMABLE AND COMBUSTIBLE LIQUIDS:</b>  <b>STORAGE AND HANDLING</b></p> <p><b>SF.40.1.</b> The storage of flammable or combustible liquids must conform to certain requirements (29 CFR 1910.107(e)(1) and (2)).</p> <p><b>SF.40.2.</b> Containers must satisfy certain requirements (29 CFR 1910.107(e)(3) and (e)(5)).</p>	<p>Verify that the storage of flammable or combustible liquids in connection with spraying operations conforms to the requirements of 29 CFR 1910.106, where applicable.</p> <p>Verify that the quantity of flammable or combustible liquids kept in the vicinity of spraying operations is the minimum required for operations and ordinarily does not exceed a supply for 1 day or one shift.</p> <p>Verify that bulk storage of portable containers of flammable or combustible liquids is in a separate, constructed building detached from other important buildings or cut off in a standard manner.</p> <p>Verify that only the following are used for bringing flammable or combustible liquids into a spray finishing room:</p> <ul style="list-style-type: none"> <li>- original closed containers</li> <li>- approved portable tanks</li> <li>- approved safety cans</li> <li>- a properly arranged system of piping.</li> </ul> <p>Verify that open or glass containers are not used for bringing flammable or combustible liquids into a spray finishing room.</p> <p>Verify that containers supplying spray nozzles are of the closed type or provided with metal covers kept closed.</p> <p>Verify that containers not resting on floors are on metal supports or suspended by wire cables.</p> <p>Verify that containers supplying spray nozzles by gravity flow do not exceed 10 gal capacity.</p> <p>Verify that original shipping containers are not subject to air pressure for supplying spray nozzles.</p> <p>Verify that containers under air pressure supplying spray nozzles are:</p> <ul style="list-style-type: none"> <li>- of limited capacity, not exceeding that necessary for 1 day's operation</li> </ul>

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<p><b>SF.40.3.</b> Transferring of liquids must be performed in accordance with certain requirements (29 CFR 1910.107(e)(4)).</p>	<ul style="list-style-type: none"> <li>- designed and approved for such use</li> <li>- provided with a visible pressure gage</li> <li>- provided with a relief valve.</li> </ul> <p>Verify that the withdrawal of flammable and combustible liquids from containers having a capacity of greater than 60 gal is by approved pumps.</p> <p>(NOTE: This requirement regarding the withdrawing liquids does not apply if otherwise specifically provided for in 29 CFR 1910.107(e)(5) (see checklist item immediately above).)</p> <p>Verify that the following operations are conducted only in a suitable mixing room or in a spraying area when the ventilating system is in operation:</p> <ul style="list-style-type: none"> <li>- the withdrawal of flammable or combustible liquids from containers</li> <li>- the filling of containers, including portable mixing tanks.</li> </ul> <p>Verify that adequate precautions are taken to protect against liquid spillage and sources of ignition.</p> <p><b>SF.40.4.</b> Pipes and hoses must satisfy certain requirements (29 CFR 1910.107(e)(6)).</p> <p>Verify that all containers or piping to which is attached a hose or flexible connection is provided with a shutoff valve at the connection.</p> <p>Verify that such valves are kept shut when spraying operations are not being conducted.</p> <p>Verify that, when a pump is used to deliver products, automatic means are provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose.</p> <p>Verify that all pressure hose and couplings are inspected at regular intervals appropriate to this service.</p> <p>Verify that the hose and couplings are tested with the hose extended, and using the in-service maximum operating pressures.</p> <p>Verify that any hose showing any of the following is withdrawn from service and repaired or discarded:</p> <ul style="list-style-type: none"> <li>- material deteriorations</li> <li>- signs of leakage</li> <li>- weakness in its carcass or at the couplings.</li> </ul> <p>Verify that piping systems conveying flammable or combustible liquids are of steel or other material having comparable properties of resistance to heat and physical damage.</p>

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<p><b>SF.40.5.</b> Spray liquid heaters must comply with certain requirements (29 CFR 1910.107(e)(7)).</p> <p><b>SF.40.6.</b> Certain positive displacement pumps must have a provision for pressure relief (29 CFR 1910.107(e)(8)).</p> <p><b>SF.40.7.</b> Certain containers must be grounded (29 CFR 1910.107(e)(9)).</p>	<p>Verify that piping systems are properly bonded and grounded.</p> <p>Verify that electrically powered spray liquid heaters are approved and listed for the specific location in which used.</p> <p>Verify that heaters are not located in spray booths nor other locations subject to the accumulation of deposits or combustible residue.</p> <p>Verify that, if an electric motor is used, the requirements of 29 CFR 1910.107(c) (see the checklist items in SF.20) are complied with.</p> <p>Determine whether flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps.</p> <p>Verify that pump discharge lines are provided with either:</p> <ul style="list-style-type: none"> <li>- an approved relief valve discharging to a pump suction or a safe detached location</li> <li>- a device provided to stop the prime mover if the discharge pressure exceeds the safe operating pressure of the system.</li> </ul> <p>Verify that, whenever flammable or combustible liquids are transferred from one container to another, both containers are effectively bonded and grounded to prevent discharge sparks of static electricity.</p>



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<p><b>SF.50 PROTECTION</b></p> <p><b>SF.50.1.</b> Sprinklers must comply with certain requirements (29 CFR 1910.107(f)(1)).</p> <p><b>SF.50.2.</b> Valves controlling automatic sprinklers must be accessible (29 CFR 1910.107(f)(2)).</p> <p><b>SF.50.3.</b> Sprinkler heads must be kept clean (29 CFR 1910.107(f)(3)).</p> <p><b>SF.50.4.</b> An adequate supply of suitable portable fire extinguishers must be installed near all spraying areas (29 CFR 1910.107(f)(4)).</p>	<p>Verify that, in sprinklered buildings, the automatic sprinkler system in rooms containing spray finishing operations conforms to the requirements of 29 CFR 1910.159.</p> <p>Verify that, in unsprinklered buildings where sprinklers are installed only to protect spraying areas, the installation conforms to such standards insofar as they are applicable.</p> <p>Verify that sprinkler heads are located so as to provide water distribution throughout the entire booth.</p> <p>Verify that automatic sprinklers protecting each spray booth (together with its connecting exhaust) are under an accessibly located separate outside stem and yoke subcontrol valve.</p> <p>Verify that sprinklers protecting spraying areas are kept as free from deposits as practical by cleaning daily if necessary.</p> <p>Verify that an adequate supply of suitable portable fire extinguishers are installed near all spraying areas.</p>



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<p><b>SF.60</b>  <b>OPERATION AND MAINTENANCE</b></p> <p><b>SF.60.1.</b> Spraying must not be conducted outside predetermined spraying areas (29 CFR 1910.107(g)(1)).</p> <p><b>SF.60.2.</b> The cleaning of spraying areas must comply with certain requirements (29 CFR 1910.107(g)(2)).</p> <p><b>SF.60.3.</b> Residue contaminated debris must be disposed of in accordance with certain requirements (29 CFR 1910.107(g)(3)).</p> <p><b>SF.60.4.</b> Spray finishing employees' clothing must not be left on the premises overnight (29 CFR 1910.107(g)(4)).</p> <p><b>SF.60.5.</b> Certain cleaning solvents must be used in accordance with specific requirements (29 CFR 1910.107(g)(5)).</p>	<p>Verify that spraying is not conducted outside predetermined spraying areas.</p> <p>Verify that all spraying areas are kept as free from the accumulation of deposits of combustible residues as practical.</p> <p>Verify that, if necessary, spraying areas are cleaned daily.</p> <p>Verify that scrapers, spuds, or other such tools used for cleaning purposes are of nonsparking material.</p> <p>Verify that residue scrapings and debris contaminated with residue are immediately removed from the premises and properly disposed of.</p> <p>Verify that approved metal waste cans are provided wherever rags or waste are impregnated with finishing material.</p> <p>Verify that all such rags or waste are deposited in these waste cans after use.</p> <p>Verify that the contents of waste cans is properly disposed of at least once daily or at the end of each shift.</p> <p>Verify that spray finishing employees' clothing is not left on the premises overnight.</p> <p>(NOTE: This requirement does not apply if the clothing is kept in metal lockers.)</p> <p>Verify that the use of solvents for cleaning operations is restricted to those having flashpoints not less than 100 °F.</p> <p>(NOTE: For cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations may be used.)</p> <p>Verify that such cleaning is conducted inside spray booths and that ventilating equipment operated during cleaning.</p>

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<b>SF.60.6.</b> Spray booths must not be used in such a manner as to create hazardous materials combinations (29 CFR 1910.107(g)(6)).	<p>Determine whether spray booths are alternately used for different types of coating materials where the combination of the materials may be conducive to spontaneous ignition.</p> <p>Verify that spray booths are not alternately used in such a manner unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second material.</p>
<b>SF.60.7.</b> No smoking signs meeting certain requirements must be posted (29 CFR 1910.107(g)(7)).	<p>Verify that "No Smoking" signs have large letters on contrasting color background.</p> <p>Verify that such signs are conspicuously posted at all spraying areas and paint storage rooms.</p>

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<p><b>SF.70 FIXED ELECTROSTATIC APPARATUS</b></p> <p><b>SF.70.1.</b> Electrostatic apparatus and devices used in connection with coating operations must be of approved types. (29 CFR 1910.107(h)(2)).</p> <p><b>SF.70.2.</b> The location of certain electrical equipment must conform to certain requirements (29 CFR 1910.107(h)(3)).</p> <p><b>SF.70.3.</b> Certain electrical apparatus must adequately supported, insulated, and grounded (29 CFR 1910.107(h)(4) and (5)).</p>	<p>(NOTE: Where electrostatic spraying equipment is installed and used, such installation and use must conform to all of the other requirements of this chapter as well as the requirements of SF.70.)</p> <p>(NOTE: The fixed electrostatic apparatus process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment which is manipulated by hand, see 29 CFR 1910.107(i) (checklist items in SF.80) for applicable requirements.)</p> <p>Verify that electrostatic apparatus and devices used in connection with coating operations are of approved types.</p> <p>Verify that transformers, power packs, control apparatus, and all other electrical portions of the equipment either:</p> <ul style="list-style-type: none"> <li>- are located outside of the spraying area</li> <li>- otherwise conform to the requirements of 29 CFR 1910.107(c) (see the checklist items in SF.20).</li> </ul> <p>(NOTE: This requirement does not apply to high-voltage grids, electrodes, and electrostatic atomizing heads and their connections.)</p> <p>Verify that electrodes are:</p> <ul style="list-style-type: none"> <li>- adequately supported in permanent locations</li> <li>- effectively insulated from the ground.</li> </ul> <p>Verify that electrostatic atomizing heads are:</p> <ul style="list-style-type: none"> <li>- adequately and permanently supported on suitable insulators</li> <li>- effectively insulated from the ground</li> <li>- effectively guarded from accidental contact or grounding.</li> </ul> <p>(NOTE: Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators, are deemed to comply with the above support requirements.)</p> <p>Verify that insulators are nonporous and noncombustible.</p>

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<p><b>SF.70.4.</b> Safe distances between goods being painted and electrodes/heads/conductors must be maintained (29 CFR 1910.107(h)(6)).</p> <p><b>SF.70.5.</b> Conveyors which satisfy specific requirements must be provided in certain circumstances (29 CFR 1910.107(h)(7)).</p> <p><b>SF.70.6.</b> Electrostatic apparatus must be equipped with fail-safe controls (29 CFR 1910.107(h)(9)).</p> <p><b>SF.70.7.</b> Equipment must be adequately guarded (29 CFR 1910.107(h)(10)).</p>	<p>Verify that high-voltage leads to electrodes are properly insulated and protected from mechanical injury or exposure to destructive chemicals.</p> <p>Verify that an automatic means is provided for grounding the electrode system when it is electrically deenergized for any reason.</p> <p>Verify that all insulators are kept clean and dry.</p> <p>Verify that a safe distance is maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors.</p> <p>Verify that this safe distance is at least twice the sparking distance.</p> <p>Verify that a suitable sign indicating this safe distance is conspicuously posted near the assembly.</p> <p>Verify that goods being painted using the fixed electrostatic apparatus process are supported on conveyors.</p> <p>Verify that the conveyors are so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times.</p> <p>Verify that any of the following are rigidly supported to prevent swinging or movement which would reduce the clearance to less than the required safe distance:</p> <ul style="list-style-type: none"> <li>- irregularly shaped goods</li> <li>- other goods subject to possible swinging or movement.</li> </ul> <p>Verify that electrostatic apparatus are equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:</p> <ul style="list-style-type: none"> <li>- stoppage of ventilating fans or failure of ventilating equipment from any cause</li> <li>- stoppage of the conveyor carrying goods through the high voltage field</li> <li>- occurrence of a ground or of an imminent ground at any point on the high voltage system</li> <li>- reduction of clearance below the required safe distance of twice the sparking distance.</li> </ul> <p>Verify that adequate booths, fencing, railings, or guards are so placed about the equipment that they ensure that a safe isolation of the process is maintained from plant storage or personnel.</p>

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<p><b>SF.70.8.</b> Ventilation must be used to ensure safe conditions (29 CFR 1910.107(h)(13)).</p> <p><b>SF.70.9.</b> Fire protection must be provided (29 CFR 1910.107(h)(12)).</p>	<p>(NOTE: This safe isolation may be ensured by either:</p> <ul style="list-style-type: none"> <li>- the guard location</li> <li>- the guard character</li> <li>- both the guard location and character.)</li> </ul> <p>Verify that such railings, fencing, and guards are both:</p> <ul style="list-style-type: none"> <li>- constructed of conducting material</li> <li>- adequately grounded.</li> </ul> <p>Verify that, where electrostatic atomization is used, the spraying area is so ventilated as to ensure safe conditions from a fire and health standpoint.</p> <p>Verify that all areas used for spraying, including the interior of the booth, are protected by automatic sprinklers where this protection is available.</p> <p>Verify that, where this protection is not available, other approved automatic extinguishing equipment is provided.</p>



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<p><b>SF.80</b>  <b>ELECTROSTATIC HAND SPRAYING EQUIPMENT</b></p> <p><b>SF.80.1.</b> Electrostatic hand spraying equipment must comply with certain requirements (29 CFR 1910.107(i)(3)).</p> <p><b>SF.80.2.</b> Electrical support equipment must comply with certain requirements (29 CFR 1910.107(i)(4)).</p> <p><b>SF.80.3.</b> Certain components must be grounded in accordance with specific requirements (29 CFR 1910.107(i)(5) and (6)).</p> <p><b>SF.80.4.</b> The grounding of objects being painted must be maintained (29 CFR 1910.107(i)(7)).</p>	<p>(NOTE: The requirements of SF.80 apply to any equipment using electrostatically charged elements for the atomization and/or precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.)</p> <p>(NOTE: Electrostatic hand spraying equipment must conform with the other provisions of this chapter as well as the requirements of SF.80.)</p> <p>Verify that transformers, powerpacks, control apparatus, and all other electrical portions of the equipment either</p> <ul style="list-style-type: none"> <li>- relocated outside of the spraying area</li> <li>- otherwise conform to the requirements of 29 CFR 1910.107(c) (see the check list items in SF.20).</li> </ul> <p>(NOTE: This requirement does not apply to the handgun itself and its connections to the power supply.)</p> <p>Verify that the handle of the spraying gun is both:</p> <ul style="list-style-type: none"> <li>- electrically connected to ground by a metallic connection</li> <li>- so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.</li> </ul> <p>Verify that all electrically conductive objects in the spraying area are adequately grounded.</p> <p>(NOTE: This requirement applies to paint containers, wash cans, and any other objects or devices in the area.)</p> <p>Verify that the equipment carries a prominent permanently installed warning regarding the necessity for this grounding feature.</p> <p>Verify that objects being painted or coated are maintained in metallic contact with the conveyor or other grounded support.</p> <p>Verify that hooks are regularly cleaned to ensure this contact.</p> <p>Verify that, where possible, areas of contact are sharp points or knife edges.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>SF.80.5.</b> Electrical equipment must be interlocked with the ventilation system (29 CFR 1910.107(i)(8)).</p> <p><b>SF.80.6.</b> Spray areas must be adequately ventilated (29 CFR 1910.107(i)(9)).</p>	<p>Verify that points of support of the object are concealed from random spray where feasible.</p> <p>Verify that, where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor is so located as to not collect spray material during normal operation.</p> <p>Verify that the electrical equipment is so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.</p> <p>Verify that the spraying operation takes place within a spray area which is adequately ventilated to remove solvent vapors released from the operation.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SF.90</b>  <b>DRYING, CURING, OR FUSION APPARATUS</b></p> <p><b>SF.90.1.</b> Spray enclosures must not be alternately used for spraying and drying (29 CFR 1910.107(j)(2)).</p> <p><b>SF.90.2.</b> Certain heating systems must not be installed in spraying areas (29 CFR 1910.107(j)(3)).</p> <p><b>SF.90.3.</b> Certain automobile refinishing spray booths or enclosures alternately used for spraying and drying must comply with certain requirements (29 CFR 1910.107(j)(4)).</p>	<p>Verify that spray booths, rooms, or other enclosures used for spraying operations are not alternately used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.</p> <p>(NOTE: The following requirement does not apply if otherwise specifically provided for in 29 CFR 1910.107(j)(4) (see the next checklist item).)</p> <p>Verify that drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks are not installed in a spraying area.</p> <p>(NOTE: Such heating systems may be installed adjacent to the spray area when equipped with an interlocked ventilating system arranged to:</p> <ul style="list-style-type: none"> <li>- thoroughly ventilate the drying space before the heating system can be started</li> <li>- maintain a safe atmosphere at any source of ignition</li> <li>- automatically shut down the heating system in the event of failure of the ventilating system.</li> </ul> <p>Determine whether automobile refinishing spray booths or enclosures are alternately being used for drying with portable electrical infrared drying apparatus.</p> <p>Verify that such booths and enclosures are:</p> <ul style="list-style-type: none"> <li>- otherwise installed and maintained in full conformity with this chapter</li> <li>- in conformance with the following requirements in this checklist item.</li> </ul> <p>Verify that the interior (especially floors) of spray enclosures is kept free of over-spray deposits.</p> <p>Verify that, during spray operations, the drying apparatus and electrical connections and wiring thereto are not located within spray enclosure nor in any other location where spray residues may be deposited thereon.</p>

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	<p>Verify that the spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure is equipped with suitable interlocks so arranged that:</p> <ul style="list-style-type: none"> <li>- the spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure</li> <li>- the spray enclosure will be purged of spray vapors for a period of not less than 3 min before the drying apparatus can be energized</li> <li>- the ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus will automatically shut off in the event of failure of the ventilating system.</li> </ul> <p>Verify that all electrical wiring and equipment of the drying apparatus conforms with the applicable sections of subpart S of 29 CFR 1910.</p> <p>Verify that only equipment of a type approved for Class I, Division 2 hazardous locations is located within 18 in. of floor level.</p> <p>Verify that all metallic parts of the drying apparatus are properly electrically bonded and grounded.</p> <p>Verify that the drying apparatus contains a prominently located, permanently attached warning sign indicating that:</p> <ul style="list-style-type: none"> <li>- ventilation should be maintained during the drying period</li> <li>- spraying should not be conducted in the vicinity that spray will deposit on apparatus.</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SF.100</b>  <b>AUTOMOBILE UNDERCOATING IN GARAGES</b></p> <p><b>SF.100.1.</b> Certain undercoating operations must comply with all of the requirements of this chapter (29 CFR 1910.107(k)).</p>	<p>Determine whether automobile undercoating spray operations in garages are both:</p> <ul style="list-style-type: none"> <li>- conducted in areas having adequate natural or mechanical ventilation, and</li> <li>- conducted using undercoating materials either: <ul style="list-style-type: none"> <li>- which are not more hazardous than kerosene (as listed by Underwriters' Laboratories in respect to fire hazard rating 30-40)</li> <li>- which contain only solvents listed as having a flash point in excess of 100 °F.</li> </ul> </li> </ul> <p>Verify that undercoating spray operations not conforming to these provisions comply with all requirements of this chapter pertaining to spray finishing operations.</p> <p>(NOTE: Automobile undercoating spray operations in conformance with these provisions are exempt from the requirements pertaining to spray finishing operations.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SF.110</b>  <b>POWDER COATING</b></p> <p><b>SF.110.1.</b> Electrical and other sources of ignition must comply with certain requirements (29 CFR 1910.107(l)(1), 1910.107(c)(8) and (c)(9)).</p> <p><b>SF.110.2.</b> Ventilation must comply with certain requirements (29 CFR 1910.107(l)(2)).</p> <p><b>SF.110.3.</b> All areas must be kept free of accumulation of dust (29 CFR 1910.107(l)(4)(i) and (ii)).</p>	<p>Verify that electrical equipment and other sources of ignition conforms to both:</p> <ul style="list-style-type: none"> <li>- subpart S of 29 CFR 1910, and</li> <li>- the appropriate requirements for: <ul style="list-style-type: none"> <li>- electrostatic apparatus (see the checklist items in SF.70 and SF.80)</li> <li>- drying, curing, and fusion apparatus (see the checklist items in SF.90)</li> <li>- automobile undercoating spray operations in garages (see the checklist items in SF.100).</li> </ul> </li> </ul> <p>Verify that portable electric lamps are not used in any spraying area during spraying operations.</p> <p>Verify that portable electric lamps, if used during cleaning or repairing operations, are of the type approved for hazardous Class I locations.</p> <p>Verify that all metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids are properly electrically grounded in an effective and permanent manner.</p> <p>(NOTE: The requirements in this checklist item are in addition to the provisions of 29 CFR 1910.107(d) (see the checklist items in SF.30).)</p> <p>Verify that exhaust ventilation is sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied.</p> <p>Verify that all nondeposited air-suspended powders are safely removed via exhaust ducts to the powder recovery cyclone or receptacle.</p> <p>Verify that each installation is designed and operated to meet the foregoing performance specification.</p> <p>Verify that powders are not released to the outside atmosphere.</p> <p>Verify that all areas are kept free of the accumulation of powder coating dusts, particularly such horizontal surfaces as ledges, beams, pipes, hoods, booths, and floors.</p> <p>Verify that surfaces are cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<b>SF.110.4.</b> No smoking signs meeting certain requirements must be posted (29 CFR 1910.107(l)(4)(iii)).	<p>Verify that "No Smoking" signs have large letters on contrasting color background.</p> <p>Verify that such signs are conspicuously posted at all powder coating areas and powder storage rooms.</p>
<b>SF.110.5.</b> Fixed electrostatic spraying equipment must comply with certain requirements (29 CFR 1910.107(l)(5)).	<p>Verify that fixed electrostatic equipment complies with the requirements in 29 CFR 1910.107(h) (see the checklist items SF.70) and the other requirements of 29 CFR 1910.107(l) (see the checklist items in SF.110).</p> <p>Verify that electrical equipment not covered by the fixed electrostatic equipment requirements of SF.70 conforms to 29 CFR 1910.107(l)(1) (see checklist item SF.110.1).</p>
<b>SF.110.6.</b> Electrostatic hand spraying equipment must comply with certain requirements (29 CFR 1910.107(l)(6)).	<p>Verify that electrostatic handguns, when used in powder coating, comply with the provisions of 29 CFR 1910.107(i) (see the checklist items in SF.80) and the other requirements of 29 CFR 1910.107(l) (see the checklist items in SF.110).</p> <p>Verify that electrical equipment not covered by the requirements for electrostatic handguns conforms to 29 CFR 1910.107(l)(1) (see checklist item SF.110.1).</p>
<b>SF.110.7.</b> Electrostatic fluidized beds must comply with certain requirements (29 CFR 1910.107(l)(7)).	<p>Verify that electrostatic fluidized beds and associated equipment are of approved types.</p> <p>Verify that the maximum surface temperature of this equipment in the coating area does not exceed 150 °F.</p> <p>Verify that the high voltage circuits are designed so as to not produce a spark of sufficient intensity to ignite any powder-air mixtures.</p> <p>Verify that the high voltage circuits are designed so as not to result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions.</p> <p>Verify that transformers, powerpacks, control apparatus, and all other electrical portions of the equipment either:</p> <ul style="list-style-type: none"> <li>- are located outside of the powder coating area</li> <li>- otherwise conform to the requirements of 29 CFR 1910.107(l)(1) (see checklist item SF.110.1).</li> </ul> <p>(NOTE: This requirement does not apply to the charging electrodes and their connections to the power supply.)</p> <p>Verify that all electrically conductive objects within the charging influence of the electrodes are adequately grounded.</p>

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	<p>Verify that the powder coating equipment carry a prominent, permanently installed warning regarding the necessity for grounding these objects.</p> <p>Verify that objects being coated are maintained in contact with the conveyor or other support in order to ensure proper grounding.</p> <p>Verify that hangers are regularly cleaned to ensure effective contact.</p> <p>Verify that areas of contact are sharp points or knife edges where possible.</p> <p>Verify that the electrical equipment is so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SF.120</b>  <b>ORGANIC PEROXIDES AND DUAL COMPONENT COATINGS</b></p> <p><b>SF.120.1.</b> Spraying operations using organic peroxides and other dual component compounds must be conducted in booths meeting specific requirements (29 CFR 1910.107(m)(1)).</p> <p><b>SF.120.2.</b> Smoking and sparking tools must not be permitted in any area where organic peroxides are stored, mixed or applied (29 CFR 1910.107(m)(2)).</p>	<p>Verify that all spraying operations involving the use of organic peroxides and other dual component coatings are conducted in approved sprinklered spray booths that meet the requirements of this chapter.</p> <p>Verify that smoking is prohibited in any area where organic peroxides are stored, mixed, or applied.</p> <p>Verify that "No Smoking" signs are prominently displayed in any area where organic peroxides are stored, mixed, or applied.</p> <p>Verify that only nonsparking tools shall be used in any area where organic peroxides are stored, mixed, or applied.</p>



## **CHAPTER 23**

### **DIP TANKS**

## CHAPTER 23

### EOH: DIP TANKS

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#### Compliance Definitions

- *Dip Tank* - a tank, vat, or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating, or similar processes (29 CFR 1910.108(a)(1)).
- *Vapor Area* - any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drainboards or associated drying conveying, or other equipment during operation or shutdown periods (29 CFR 1910.108(a)(2)).



**EOH: DIP TANKS**

**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Ventilation	DT.10.1 through DT.10.4	23-5



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>DT.10</b> <b>VENTILATION</b></p> <p><b>DT.10.1.</b> Vapor areas must be limited to the smallest practical space (29 CFR 1910.108 (b)(1)).</p> <p><b>DT.10.2.</b> Required ventilating systems must conform to specific standards (29 CFR 1910.108(b)(1)).</p> <p><b>DT.10.3.</b> Required ventilating systems must be equipped to stop any dipping conveyor systems automatically (29 CFR 1910.108 (b)(1)).</p> <p><b>DT.10.4.</b> Required ventilating systems that serve associated drying operations using heating systems that may be sources of ignition must meet specific requirements (29 CFR 1910.108 (b)(2)).</p>	<p>Verify that the installation limits vapor areas to the smallest practical space by maintaining a properly designed system of mechanical ventilation around vapor areas.</p> <p>Verify that the ventilation system moves air from all directions toward the vapor area origin and then to a safe outside location.</p> <p>Verify that the installation's ventilating systems conform to the Standards for Blower and Exhaust Systems (NFPA Pamphlet No. 91-1969).</p> <p>Verify that the installation's ventilating systems are arranged so that the failure of any ventilating fan automatically stops any dipping conveyor system.</p> <p>Verify that the ventilating system conforms to the Standard for Ovens and Furnaces (NFPA No. 86A-1969).</p> <p>Verify that the ventilating system provides a means for prevention before the heating system can be started.</p> <p>Verify that the ventilating system is arranged so that the failure of any ventilating fan automatically shuts down the associated heating system.</p>



## **CHAPTER 24**

### **AIR CONTAMINANTS**

## CHAPTER 24

### EOH: AIR CONTAMINANTS

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#### Compliance Definitions

- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8 h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).



## EOH: AIR CONTAMINANTS

### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
General Requirements	AC.10.1 through AC.10.3	24-5
Appendix 24-1, <i>Limits for Air Contaminants (Table Z-1)</i>		24-7
Appendix 24-2, <i>Limits for Air Contaminants (Table Z-2)</i>		24-23
Appendix 24-3, <i>Mineral Dusts</i>		24-25



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>AC.10 GENERAL REQUIREMENTS</b></p> <p><b>AC.10.1.</b> Installation personnel must not exceed the exposure limits specified for the air contaminants in Appendix 24-1 (29 CFR 1910.1000(a)).</p> <p><b>AC.10.2.</b> Installation personnel must not exceed the exposure limits specified for the air contaminants in Appendix 24-2 (29 CFR 1910.1000(b)).</p> <p><b>AC.10.3.</b> Installation personnel must not exceed the exposure limits specified for the mineral dusts in Appendix 24-3 (29 CFR 1910.1000 (c)).</p>	<p>(NOTE: AFOSH STD 48-8, <i>Controlling Exposures to Hazardous Substances</i>, requires the use of the most recent Threshold Limit Values published in <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (which is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.)</p> <p>Verify that the exposure level of personnel to the substances in Appendix 24-1 does not at any time exceed the exposure limits preceded by a ceiling value.</p> <p>Verify that, if instantaneous monitoring is not feasible, the ceiling value is assessed as a 15-min TWA exposure limit that is not exceeded at any time during the working day.</p> <p>Verify that the exposure level of personnel to the substances in Appendix 24-1 does not exceed the 8-h TWA exposure limits (i.e., those not preceded by a ceiling value in the appendix) in any 8-h work shift of a 40-h work week.</p> <p>Verify that the exposure level of personnel to the substances in Appendix 24-2 does not exceed:</p> <ul style="list-style-type: none"> <li>- the 8-h TWA exposure limit for a substance in any 8-h work shift of a 40-h work week</li> <li>- the acceptable ceiling concentration limit at any time during an 8-h work shift.</li> </ul> <p>(NOTE: The acceptable ceiling concentration limit may be exceeded for a time period and up to a concentration not exceeding the maximum duration and concentration allowed under the Acceptable Maximum Peak Above the Acceptable Ceiling Concentration for an 8-h Shift column in Appendix 24-2.)</p> <p>Verify that the exposure level of personnel to the substances in Appendix 24-3 does not exceed the 8-h TWA exposure limits in any 8-h work shift of a 40-h work week.</p>



## Appendix 24-1

### Limits for Air Contaminants (29 CFR 1910.1000, Table Z-1)

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Acetaldehyde	75-07-0	200	360	
Acetic acid	64-19-7	10	25	
Acetic anhydride	108-24-7	5	20	
Acetone	67-64-1	1000	2400	
Acetonitrile	75-05-8	40	70	
2-Acetylaminofluorine; <i>see</i> 29 CFR 1910.1014				
Acetylene dichloride; <i>see</i> 1,2-Dichloroethylene				
Acetylene tetrabromide	79-27-6	1	14	
Acrolein	107-02-8	0.1	0.25	
Acrylamide	79-06-1		0.3	X
Acrylonitrile; <i>see</i> 29 CFR 1910.1045				
Aldrin	309-00-2		0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	
Allyl glycidyl ether(AGE)	106-92-3	(C)10	(C)45	
alpha-Alumina Total dust Respirable fraction			15 5	
Aluminum Metal (as Al) Total dust Respirable fraction	7429-90-5		15 5	
4-Aminodiphenyl; <i>see</i> 29 CFR 1910.1011	92-67-1			
2-Aminoethanol; <i>see</i> Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	
Ammonia	7664-41-7	50	35	
Ammonium sulfamate Total dust Respirable fraction	7773-06-0		15 5	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl acetate	626-38-0	125	650	
Aniline and homologs	62-53-3	5	19	X
Anisidine (o-,p-isomers)	29191-52-4		0.5	X
Antimony and compounds (as Sb)	7440-36-0		0.5	
ANTU (alpha Naphthylthiourea)	86-88-4		0.3	
Arsenic, inorganic compounds (as As); <i>see</i> 29 CFR 1910.1018	7440-38-2			
Arsenic, organic compounds (as As)	7440-38-2		0.5	
Arsine	7784-42-1	0.05	0.2	
Asbestos; <i>see</i> 29 CFR 1910.1001	(4)			
Azinphos-methyl	86-50-0		0.2	X
Barium, soluble compounds (as Ba)	7440-39-3		0.5	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Barium sulfate Total dust Respirable fraction	7727-43-7		15 5	
Benomyl Total dust Respirable fraction	17804-35-2		15 5	
Benzene; <i>see</i> 29 CFR 1910.1028 ( <i>See</i> Appendix 24-2 for the limits applicable in the operations or sectors excluded in 29 CFR 1910.1028 <sup>(d)</sup> )	71-43-2			
Benzidin; <i>see</i> 29 CFR 1910.1010	92-87-5			
p-Benzoquinone; <i>see</i> Quinone				
Benzo(a)pyrene; <i>see</i> coal tar pitch volatiles				
Benzoyl peroxide	94-36-0		5	
Benzyl chloride	100-44-7	1	5	
Beryllium and beryllium compounds (as Be)	7440-41-7		(2)	
Biphenyl; <i>see</i> Diphenyl				
Bismuth telluride, Undoped Total dust Respirable fraction	1304-82-1		15 5	
Boron oxide Total dust	1303-86-2		15	
Boron trifluoride	7637-07-2	(C)1	(C)3	
Bromine	7726-95-6	0.1	0.7	
Bromoform	75-25-2	0.5	5	X
Butadiene(1,3-Butadiene)	106-99-0	See 29 CFR 1910.1051; 29 CFR 1910.19(1)		
Butanethiol; <i>see</i> Butyl mercaptan				
2-Butanone(Methyl ethyl ketone)	78-93-3	200	590	
2-Butoxyethanol	111-76-2	50	240	
n-Butyl-acetate	123-86-4	150	710	
sec-Butyl acetate	105-46-4	200	950	
tert-Butyl-acetate	540-88-5	200	950	
n-Butyl alcohol	71-36-3	100	300	
sec-Butyl alcohol	78-92-2	150	450	
tert-Butyl alcohol	75-65-0	100	300	
Butylamine	109-73-9	(C)5	(C)15	X
tert-Butyl chromate (as CrO <sub>3</sub> )	1189-85-1		(C)0.1	X
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	
Butyl mercaptan	109-79-5	10	35	
p-tert-Butyltoluene	98-51-1	10	60	
Cadmium (as Cd) <i>see</i> 29 CFR 1910.1027	7440-43-9			
Calcium Carbonate Total dust Respirable fraction	1317-65-3		15 5	
Calcium hydroxide Total dust	1305-62-0		15	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Respirable fraction			5	
Calcium oxide	1305-78-8		5	
Calcium silicate	1344-95-2		15	
Total dust			5	
Respirable fraction				
Calcium sulfate	7778-18-9		15	
Total dust			5	
Respirable fraction				
Camphor, synthetic	76-22-2		2	
Carbaryl (Sevin)	63-25-2		5	
Carbon black	1333-86-4		3.5	
Carbon dioxide	124-38-9	5000	9000	
Carbon disulfide	75-15-0		(2)	
Carbon monoxide	630-08-0	50	55	
Carbon tetrachloride	56-23-5		(2)	
Cellulose	9004-34-6		15	
Total dust			5	
Respirable fraction				
Chlordane	57-74-9		0.5	X
Chlorinated camphene	8001-35-2		0.5	X
Chlorinated diphenyloxide	55720-99-5		0.5	
Chlorine	7782-50-5	(C)1	(C)3	
Chlorine dioxide	10049-04-4	0.1	0.3	
Chlorine trifluoride	7790-91-2	(C)0.1	(C)0.4	
Chloroacetaldehyde	107-20-0	(C)1	(C)3	
a-Chloroacetophenone (Phenacyl chloride)	532-27-4	0.05	0.3	
Chlorobenzene	108-90-7	75	350	
o-Chlorobenzylidene malononitrile	2698-41-1	0.05	0.4	
Chlorobromomethane	74-97-5	200	1050	
2-Chloro-1,3-butadiene <i>see</i> beta-Chloroprene				
Chlorodiphenyl(42% Chlorine)(PCB)	53469-21-9		1	X
Chlorodiphenyl (54% Chlorine) (Polychlorinated Biphenyl (PCB))	11097-69-1		0.5	X
1-Chloro-2,3-epoxypropane <i>see</i> Epichlorohydrin				
2-Chloroethanol; <i>see</i> Ethylene chlorohydrin				
Chloroethylene <i>see</i> Vinyl chloride				
Chloroform (Trichloromethane)	67-66-3	(C)50	(C)240	
bis(Chloromethyl) ether, <i>see</i> 29 CFR 1910.1008	542-88-1			
Chloromethyl methyl ether, <i>see</i> 29 CFR 1910.1006	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	
Chloropicrin	76-06-2	0.1	0.7	
beta-Chloroprene	126-99-8	25	90	X

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Total dust Respirable fraction			15 5	
Chromic acid andchromates (as CrO(3))	(4)		(2)	
Chromium (II) compounds (as Cr)	7440-47-3		0.5	
Chromium (III) compounds (as Cr)	7440-47-3		0.5	
Chromium metal andinsol salts (as Cr)	7440-47-3		1	
Chrysene; <i>see</i> Coal ta pitch volatiles				
Clopidol Total dust Respirable fraction	2971-90-6		15 5	
Coal dust (less than 5% SiO(2)), res- pirable fraction			(3)	
Coal dust (greater than or equal to 5% SiO(2)), respirable fraction			(3)	
Coal tar pitch volatiles (benzene sol- uble fraction), anthracene, BaP, phe- nanthrene, acridine, chrysene,pyrene	65966-93-2		0.2	
Cobalt metal, dust,and fume (as Co)	7440-48-4		0.1	
Coke oven emissions <i>see</i> 29 CFR 1910.1029				
Copper Fume (as Cu) Dusts and mists (as Cu)	7440-50-8		0.1 1	
Cotton dust <sup>(e)</sup> , <i>see</i> 29 CFR 1910.1043			1	
Crag herbicide (Sesone) Total dust Respirable fraction	136-78-7		15 5	
Cresol, all isomers	1319-77-3	5	22	X
Crotonaldehyde	123-73-9 4170-30-3	2	6	
Cumene	98-82-8	50	245	X
Cyanides (as CN)	(4)		5	
Cyclohexane	110-82-7	300	1050	
Cyclohexanol	108-93-0	50	200	
Cyclohexanone	108-94-1	50	200	
Cyclohexene	110-83-8	300	1015	
Cyclopentadiene	542-92-7	75	200	
2,4-D (Dichlorophen-oxyacetic acid)	94-75-7		10	
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox)	8065-48-3		0.1	X
Diacetone alcohol (4-Hydroxy-4- methyl-2-pentanone)	123-42-2	50	240	
1,2-Diaminoethane; <i>see</i> Ethylenedi- amine				
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
1,2-Dibromo-3-chloropropane (CBCP); <i>see</i> 29 CFR 1910.1044	96-12-8			

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
1,2-Dibromoethane; <i>see</i> Ethylene dibromide				
Dibutyl phosphate	107-66-4	1	5	
Dibutyl phthalate	84-74-2		5	
o-Dichlorobenzene	95-50-1	(C)50	(C)300	
p-Dichlorobenzene	106-46-7	75	450	
3,3'-Dichlorobenzidine; <i>see</i> 29 CFR 1910.1007	91-94-1			
Dichlorodifluoromethane	75-71-8	1000	4950	
1,3-Dichloro-5, 5-dimethyl hydantoin	118-52-5		0.2	
Dichlorodiphenyltri-chloroethane (DDT)	50-29-3		1	X
1,1-Dichloroethane	75-34-3	100	400	
1,2-Dichloroethane; <i>see</i> Ethylene dichloride				
1,2-Dichloroethylene	540-59-0	200	790	
Dichloroethyl ether	111-44-4	(C)15	(C)90	X
Dichloromethane; <i>see</i> Methylene chloride				
Dichloromonofluoro-methane	75-43-4	1000	4200	
1,1-Dichloro-1-nitroethane	594-72-9	(C)10	(C)60	
1,2-Dichloropropane; <i>see</i> Propylene dichloride				
Dichlorotetrafluoro-ethane	76-14-2	1000	7000	
Dichlorvos (DDVP)	62-73-7		1	X
Dicyclopentadienyl iron Total dust Respirable fraction	102-54-5		15 5	
Dieldrin	60-57-1		0.25	X
Diethylamine	109-89-7	25	75	
2-Diethylaminoethanol	100-37-8	10	50	
X Diethyl ether; <i>see</i> Ethyl ether				
Difluorodibromomethane	75-61-6	100	860	
Diglycidyl ether (DGE)	2238-07-5	(C)0.5	(C)2.8	
Dihydroxybenzene; <i>see</i> Hydroquinone				
Diisobutyl ketone	108-83-8	50	290	
Diisopropylamine	108-18-9	5	20	X
4-Dimethylaminoazo-benzene; <i>see</i> 29 CFR 1910.1015	60-11-7			
Dimethoxymethane; <i>see</i> Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	
Dimethylaminobenzene; <i>see</i> Xylidine				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene; <i>see</i> Xylene				
Dimethyl-1,2-dibromo-2, 2-dichloro-ethyl phosphate	300-76-5		3	
Dimethylformamide	68-12-2	10	30	X

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
2,6-Dimethyl-4-heptanone; <i>see</i> Di-isobutyl ketone				
1,1-Dimethylhydrazine	57-14-7	0.5	1	X
Dimethylphthalate	131-11-3		5	
Dimethyl sulfate	77-78-1	1	5	X
Dinitrobenzene (all isomers)			1	X
(ortho)	528-29-0			
(meta)	99-65-0			
(para)	100-25-4			
Dinitro-o-cresol	534-52-1		0.2	X
Dinitrotoluene	25321-14-6		1.5	X
Dioxane (Diethylene dioxide)	123-91-1	100	360	X
Diphenyl (Biphenyl)	92-52-4	0.2	1	
Diphenylmethane diisocyanate; <i>see</i> Methylene bisphenyl isocyanate				
Dipropylene glycol methyl ether	34590-94-8	100	600	
X Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate)	117-81-7		5	
Emery Total dust Respirable fraction	12415-34-8		15 5	
Endosulfan	115-29-7		0.1	X
Endrin	72-20-8		0.1	X
Epichlorohydrin	106-89-8	5	19	X
EPN	2104-64-5		0.5	X
1,2-Epoxypropane; <i>see</i> Propylene oxide				
2,3-Epoxy-1-propanol; <i>see</i> Glycidol				
Ethanethiol; <i>see</i> Ethyl mercaptan				
Ethanolamine	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve)	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100	540	X
Ethyl acetate	141-78-6	400	1400	
Ethyl acrylate	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	
Ethylamine	75-04-7	10	18	
Ethyl amyl ketone (5-Methyl-3-heptanone)	541-85-5	25	130	
Ethyl benzene	100-41-4	100	435	
Ethyl bromide	74-96-4	200	890	
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	
Ethyl chloride	75-00-3	1000	2600	
Ethyl ether	60-29-7	400	1200	
Ethyl formate	109-94-4	100	300	
Ethyl mercaptan	75-08-1	(C)10	(C)25	
Ethyl silicate	78-10-4	100	850	
Ethylene chlorohydrin	107-07-3	5	16	X
Ethylenediamine	107-15-3	10	25	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Ethylene dibromide	106-93-4		(2)	
Ethylene dichloride (1,2-Dichloroethane)	107-06-2		(2)	
Ethylene glycol dinitrate	628-96-6	(C)0.2	(C)1	X
Ethylene glycol methyl acetate; <i>see</i> Methyl cellosolve acetate				
Ethyleneimine; <i>see</i> 29 CFR 1910.1012	151-56-4			
Ethylene oxide; <i>see</i> 29 CFR 1910.1047	75-21-8			
Ethylidene chloride; <i>see</i> 1,1-Dichloroethane				
N-Ethylmorpholine	100-74-3	20	94	X
Ferbam Total dust	14484-64-1		15	
Ferrovandium dust	12604-58-9		1	
Fluorides (as F)	(4)		2.5	
Fluorine	7782-41-4	0.1	0.2	
Fluorotrichloromethane (Trichlorofluoromethane)	75-69-4	1000	5600	
Formaldehyde; <i>see</i> 29 CFR 1910.1048	50-00-0			
Formic acid	64-18-6	5	9	
Furfural	98-01-1	5	20	X
Furfuryl alcohol	98-00-0	50	200	
Grain dust (oat, wheat, barley)			10	
Glycerin (mist) Total dust Respirable fraction	56-81-5		15 5	
Glycidol	556-52-5	50	150	
Glycol monoethyl ether; <i>see</i> 2-Ethoxyethanol				
Graphite, natural respirable dust	7782-42-5		(3)	
Graphite, synthetic Total dust Respirable Fraction			15 5	
Guthion; <i>see</i> Azinphos methyl				
Gypsum Total dust Respirable fraction	13397-24-5		15 5	
Hafnium	7440-58-6		0.5	
Heptachlor	76-44-8		0.5	X
Heptane (n-Heptane)	142-82-5	500	2000	
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	1335-87-1		0.2	X
n-Hexane	110-54-3	500	1800	
2-Hexanone (Methyl n-butyl ketone)	591-78-6	100	410	
Hexone (Methyl isobutyl ketone)	108-10-1	100	410	
sec-Hexyl acetate	108-84-9	50	300	
Hydrazine	302-01-2	1	1.3	X

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Hydrogen bromide	10035-10-6	3	10	
Hydrogen chloride	7647-01-0	(C)5	(C)7	
Hydrogen cyanide	74-90-8	10	11	X
Hydrogen fluoride (as F)	7664-39-3		(2)	
Hydrogen peroxide	7722-84-1	1	1.4	
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	
Hydrogen sulfide	7783-06-4		(2)	
Hydroquinone	123-31-9		2	
Iodine	7553-56-2	(C)0.1	(C)1	
Iron oxide fume	1309-37-1		10	
Isomyl acetate	123-92-2	100	525	
Isomyl alcohol (primary and secondary)	123-51-3	100	360	
Isobutyl acetate	110-19-0	150	700	
Isobutyl alcohol	78-83-1	100	300	
Isophorone	78-59-1	25	140	
Isopropyl acetate	108-21-4	250	950	
Isopropyl alcohol	67-63-0	400	980	
Isopropylamine	75-31-0	5	12	
Isopropyl ether	108-20-3	500	2100	
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	
Kaolin Total dust Respirable fraction	1332-58-7		15 5	
Ketene	463-51-4	0.5	0.9	
Lead inorganic (as Pb); see 29 CFR 1910.1025	7439-92-1			
Limestone Total dust Respirable fraction	1317-65-3		15 5	
Lindane	58-89-9		0.5	X
Lithium hydride	7580-67-8		0.025	
LPG (liquefied petroleum gas)	68476-85-7	1000	1800	
Magnesite Total dust Respirable fraction	546-93-0		15 5	
Magnesium oxide fume Total Particulate	1309-48-4		15	
Malathion Total dust	121-75-5		15	X
Maleic anhydride	108-31-6	0.25	1	
Manganese compounds (as Mn)	7439-96-5		(C)5	
Manganese fume (as Mn)	7439-96-5		(C)5	
Marble Total dust Respirable fraction	1317-65-3		15 5	
Mercury (aryl and inorganic)(as Hg)	7439-97-6		(2)	
Mercury (organo) alkyl compounds	7439-97-6		(2)	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
(as Hg)				
Mercury (vapor) (as Hg)	7439-97-6		(2)	
Mesityl oxide	141-79-7	25	100	
Methanethiol; <i>see</i> Methyl mercaptan				
Methoxychlor Total dust	72-43-5		15	
2-Methoxyethanol; (Methyl cello- solve)	109-86-4	25	80	X
2- Methoxyethyl acetate(Methyl cel- losolve acetate)	110-49-6	25	120	X
Methyl acetate	79-20-9	200	610	
Methyl acetylene (Propyne)	74-99-7	1000	1650	
Methyl acetylene propadiene mixture (MAPP)		1000	1800	
Methyl acrylate	96-33-3	10	35	X
Methylal (Dimethoxy-methane)	109-87-5	1000	3100	
Methyl alcohol	67-56-1	200	260	
Methylamine	74-89-5	10	12	
Methyl amyl alcohol; <i>see</i> Methyl Isobutyl carbinol				
Methyl n-amyl ketone	110-43-0	100	465	
Methyl bromide	74-83-9	(C)20	(C)80	X
Methyl butyl ketone; <i>see</i> 2-Hexanone				
Methyl cellosolve; <i>see</i> 2-Methoxy- ethanol				
Methyl cellosolveacetate; <i>see</i> 2- Methoxyethyl acetate				
Methyl chloride	74-87-3		(2)	
Methyl chloroform (1,1,1-Trichloro- ethane)	71-55-6	350	1900	
Methylcyclohexane	108-87-2	500	2000	
Methylcyclohexanol	25639-42-3	100	470	
o-Methylcyclohexanone	583-60-8	100	460	X
Methylene chloride	75-09-2		(2)	
Methyl ethyl ketone (MEK); <i>see</i> 2- Butanone				
Methyl formate	107-31-3	100	250	
Methyl hydrazine (Monomethyl hy- drazine)	60-34-4	(C)0.2	(C)0.35	X
Methyl iodide	74-88-4	5	28	X
Methyl isoamyl ketone	110-12-3	100	475	
Methyl isobutyl arbinol	108-11-2	25	100	X
Methyl isobutyl ketone; <i>see</i> Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
Methyl mercaptan	74-93-1	(C)10	(C)20	
Methyl methacrylate	80-62-6	100	410	
Methyl propyl ketone; <i>see</i> 2-Pen- tanone				
alpha-Methyl styrene	98-83-9	(C)100	(C)480	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Methylene bisphenyl isocyanate (MDI)	101-68-8	(C)0.02	(C)0.2	
Mica; <i>see</i> Silicates				
Molybdenum (as Mo)	7439-98-7		5	
Soluble compounds				
Insoluble Compounds			15	
Total dust				
Monomethyl aniline	100-61-8	2	9	X
Monomethyl hydrazine; <i>see</i> Methyl hydrazine				
Morpholine	110-91-8	20	70	X
Naphtha (Coal tar)	8030-30-6	100	400	
Naphthalene	91-20-3	10	50	
alpha-Naphthylamine; <i>see</i> 29 CFR 1910.1004	134-32-7			
beta-Naphthylamine; <i>see</i> 29 CFR 1910.1009	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds (as Ni)	7440-02-0		1	
Nickel, soluble compounds (as Ni)	7440-02-0		1	
Nicotine	54-11-5		0.5	X
Nitric acid	7697-37-2	2	5	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-95-3	1	5	X
p-Nitrochlorobenzene	100-00-5		1	X
4-Nitrodiphenyl; <i>see</i> 29 CFR 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	
Nitrogen dioxide	10102-44-0	(C)5	(C)9	
Nitrogen trifluoride	7783-54-2	10	29	
Nitroglycerin	55-63-0	(C)0.2	(C)2	X
Nitromethane	75-52-5	100	250	
1-Nitropropane	108-03-2	25	90	
2-Nitropropane	79-46-9	25	90	
N-Nitrosodimethylamine; <i>see</i> 29 CFR 1910.1016				
Nitrotoluene (all isomers)		5	30	X
o-isomer	88-72-2			
m-isomer	99-08-1			
p-isomer	99-99-0			
Nitrotrichloromethane; <i>see</i> Chloropicrin				
Octachloronaphthalene	2234-13-1		0.1	X
Octane	111-65-9	500	2350	
Oil mist, mineral	8012-95-1		5	
Osmium tetroxide (as Os)	20816-12-0		0.002	
Oxalic acid	144-62-7		1	
Oxygen difluoride	7783-41-7	0.05	0.1	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Ozone	10028-15-6	0.1	0.2	
Paraquat, respirable dust	4685-14-7 1910-42-5 2074-50-2		0.5	X
Parathion	56-38-2		0.1	X
Particulates not otherwise regulated (PNOR) <sup>(f)</sup> Total dust Respirable fraction			15 5	
PCB; see Chlorodiphenyl (42% and 54% chlorine)				
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8		0.5	X
Pentachlorophenol	87-86-5		0.5	X
Pentaerythritol Total dust Respirable fraction	115-77-5		15 5	
Pentane	109-66-0	1000	2950	
2-Pentanone (Methyl propyl ketone)	107-87-9	200	700	
Perchloroethylene (Tetrachloroethylene)	127-18-4		(2)	
Perchloromethyl mercaptan	594-42-3	0.1	0.8	
Perchloryl fluoride	7616-94-6	3	13.5	
Perlite Total dust Respirable fraction	93763-70-3		15 5	
Petroleum distillates (Naphtha)(Rubber Solvent)		500	2000	
Phenol	108-95-2	5	19	X
p-Phenylene diamine	106-50-3		0.1	X
Phenyl ether, vapor	101-84-8	1	7	
Phenyl ether-biphenyl mixture, vapor		1	7	
Phenylethylene: see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	
Phenylhydrazine	100-63-0	5	22	X
Phosdrin (Mevinphos)	7786-34-7		0.1	X
Phosgene (Carbonyl chloride)	75-44-5	0.1	0.4	
Phosphine	7803-51-2	0.3	0.4	
Phosphoric acid	7664-38-2		1	
Phosphorus (yellow)	7723-14-0		0.1	
Phosphorus pentachloride	10026-13-8		1	
Phosphorus pentasulfide	1314-80-3		1	
Phosphorus trichloride	7719-12-2	0.5	3	
Phthalic anhydride	85-44-9	2	12	
Picloram Total dust Respirable fraction	1918-02-1		15 5	
Picric acid	88-89-1		0.1	X
Pindone (2-Pivalyl-1, 3-indandione)	83-26-1		0.1	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Pindone (2-Pivalyl-1, 3-indandione)	83-26-1		0.1	
Plaster of paris Total dust Respirable fraction	26499-65-0		15 5	
Platinum (as Pt) Metal Soluble Salts	7440-06-4		0.002	
Portland cement Total dust Respirable fraction	65997-15-1		15 5	
Propane	74-98-6	1000	1800	
beta-Propiolactone; <i>see</i> 29 CFR 1910.1013	57-57-8			
n-Propyl acetate	109-60-4	200	840	
n-Propyl alcohol	71-23-8	200	500	
n-Propyl nitrate	627-13-4	25	110	
Propylene dichloride	78-87-5	75	350	
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	
Propyne; <i>see</i> Methyl acetylene				
Pyrethrum	8003-34-7		5	
Pyridine	110-86-1	5	15	
Quinone	106-51-4	0.1	0.4	
RDX; <i>see</i> Cyclonite				
Rhodium (as Rh), metalfume and insoluble compounds	7440-16-6		0.1	
Rhodium (as Rh), soluble compounds	7440-16-6		0.001	
Ronnel	299-84-3		15	
Rotenone	83-79-4		5	
Rouge Total dust Respirable fraction			15 5	
Selenium compounds (as Se)	7782-49-2		0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
Silica, amorphous, precipitated and gel	112926-00-8		(3)	
Silica, amorpous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2		(3)	
Silica, crystalline cristobalite, respirable dust	14464-46-1		(3)	
Silica, crystalline quartz, respirable dust	14808-60-7		(3)	
Silica, crystalline tripoli (as quartz), respirable dust	1317-95-9		(3)	
Silica, crystalline tridymite, respirable dust	15468-32-3		(3)	
Silica, fused, respirable dust	60676-86-0		(3)	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Silicates (less than 1% crystalline silica) Mica (respirable dust) Soapstone, total dust Soapstone, respirable dust Talc (containing asbestos): use asbestos limit: <i>see</i> 29 CFR 1910.1001 Talc (containing no asbestos), respirable dust Tremolite, asbestiform; <i>see</i> 29 CFR 1910.1001	12001-26-2      14807-96-6		(3) (3) (3) (3)  (3)	
Silicon Total dust Respirable fraction	7440-21-3		15 5	
Silicon carbide Total dust Respirable fraction	409-21-2		15 5	
Silver, metal and soluble compounds (as Ag)	7440-22-4		0.01	
Soapstone; <i>see</i> Silicates				
Sodium fluoroacetate	62-74-8		0.05	X
Sodium hydroxide	1310-73-2		2	
Starch Total dust Respirable fraction	9005-25-8		15 5	
Stibine	7803-52-3	0.1	0.5	
Stoddard solvent	8052-41-3	500	2900	
Strychnine	57-24-9		0.15	
Styrene	100-42-5		(2)	
Sucrose Total dust Respirable fraction	57-50-1		15 5	
Sulfur dioxide	7446-09-5	5	13	
Sulfur hexafluoride	2551-62-4	1000	6000	
Sulfuric acid	7664-93-9		1	
Sulfur monochloride	10025-67-9	1	6	
Sulfur pentafluoride	5714-22-7	0.025	0.25	
Sulfuryl fluoride	2699-79-8	5	20	
Systox; <i>see</i> Demeton 2,4,5-T (2,4,5-tri-chlorophenoxyacetic acid)	93-76-5		10	
Talc; <i>see</i> Silicates				
Tantalum, metal, and oxide dust	7440-25-7		5	
TEDP (Sulfotep)	3689-24-5		0.2	X
Tellurium and compounds (as Te)	13494-80-9		0.1	
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2	
Temephos Total dust Respirable fraction	3383-96-8		15 5	
TEPP (Tetraethyl pyrophosphate)	107-49-3		0.05	X
Terphenylis	26140-60-3	(C)1	(C)9	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
1,1,1,2-Tetrachloro-2, 2-difluoroethane	76-11-9	500	4170	
1,1,2,2-Tetrachloro-1, 2-difluoroethane	76-12-0	500	4170	
1,1,2,2-Tetrachloro-ethane	79-34-5	5	35	X
Tetrachoroethylene; <i>see</i> Perchloroethylene				
Tetrachloromethane; <i>see</i> Carbon tetrachloride				
Tetrachloronaphthalene	1335-88-2		2	X
Tetraethyl lead (as Pb)	78-00-2		0.075	X
Tetrahydrofuran	109-99-9	200	590	
Tetramethyl lead, (as Pb)	75-74-1		0.075	X
Tetramethyl succinonitrile	3333-52-6	0.5	3	X
Tetranitromethane	509-14-8	1	8	
Tetryl (2,4,6-Trinitro-phenylmethyl-nitramine)	479-45-8		1.5	X
Thallium, soluble compounds (as Tl)	7440-28-0		0.1	X
4,4'-Thiobis(6-tert, Butyl-m-cresol) Total dust Respirable fraction	96-69-5		15 5	
Thiram	137-26-8		5	
Tin, inorganic compounds (except oxides) (as Sn)	7440-31-5		2	
Tin, organic compounds (as Sn)	7440-31-5		0.1	
Titanium dioxide Total dust	13463-67-7		15	
Toluene	108-88-3		(2)	
Toluene-2, 4-diisocyanate (TDI)	584-84-9	(C)0.02	(C)0.14	
o-Toluidine	95-53-4	5	22	X
Toxaphene; <i>see</i> Chlorinated camphene				
Tremolite; <i>see</i> Silicates				
Tributyl phosphate	126-73-8		5	
1,1,1-Trichloroethane; <i>see</i> Methyl chloroform				
1,1,2-Trichloroethane	79-00-5	10	45	X
Trichloroethylene	79-01-6		(2)	
Trichloromethane; <i>see</i> Chloroform				
Trichloronaphthalene	1321-65-9		5	X
1,2,3-Trichloropropane	96-18-4	50	300	
1,1,2-Trichloro-1,2, 2-trifluoroethane	76-13-1	1000	7600	
Triethylamine	121-44-8	25	100	
Trifluorobromomethane	75-63-8	1000	6100	
2,4,6-Trinitrophenyl; <i>see</i> Picric acid				
2,4,6-Trinitrophenyl-methyl nitramine; <i>see</i> Tetryl				
2,4,6-Trinitrotoluene (TNT)	118-96-7		1.5	X
Triorthocresyl phosphate	78-30-8		0.1	
Triphenyl phosphate	115-86-6		3	

Substance	CAS No. (c)	ppm(a) <sup>1</sup>	mg/m <sup>3</sup> (b) <sup>1</sup>	Skin Designation
Turpentine	8006-64-2	100	560	
Uranium (as U) Soluble compounds Insoluble compounds	7440-61-1		0.05 0.05	
Vanadium Respirable dust (as V(2)O(5)) Fume (as V(2)O(5))	1314-62-1		(C)0.5 (C)0.1	
Vegetable oil mist Total dust Respirable fraction			15 5	
Vinyl benzene; <i>see</i> Styrene				
Vinyl chloride; <i>see</i> 29 CFR 1910.1017	75-01-4			
Vinyl cyanide; <i>see</i> Acrylonitrile				
Vinyl toluene	25013-15-4	100	480	
Warfarin	81-81-2		0.1	
Xylenes (o-, m-, p-isomers)	1330-20-7	100	435	
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-5		1	
Zinc chloride fume	7646-85-7		1	
Zinc oxide fume	1314-13-2		5	
Zinc oxide Total dust Respirable fraction	1314-13-2		15 5	
Zinc stearate Total dust Respirable fraction	557-05-1		15 5	
Zirconium compounds (as Zr)	7440-67-7		5	

<sup>1</sup> The OELs are 8-h TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 °C and 760 torr.

(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound, measured as the metal, the CAS number for the metal is given -- not CAS numbers for the individual compounds.

(d) The final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Appendix 24-2 apply. See 29 CFR 1910.1028 for specific circumstances.

(e) This 8-h TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The TWA applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and ginning. See also 29 CFR 1910.1043 for cotton dust limits applicable to other sectors.

(f) All inert or nuisance dusts, whether mineral, inorganic or organic, not listed specifically by substance name are covered by the *Particulates Not Otherwise Regulated* (PNOR) limit, which is the same as the inert or nuisance dust limit of Appendix 24-3.

<sup>2</sup> See Appendix 24-2.



## Appendix 24-2

### Limits for Air Contaminants (29 CFR 1910.1000, Table Z-2)

Substance	8-h time- weighted average (TWA)	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-h shift	
			Concentration	Maximum Duration
Benzene <sup>a</sup> (Z37.40-1969)	10 ppm	25 ppm	50 ppm	10 min
Beryllium and beryllium compounds (Z37.29-1970)	2 µg/m <sup>3</sup>	<sup>5</sup> µg/m <sup>3</sup>	<sup>25</sup> µg/m <sup>3</sup>	30 min
Cadmium fume <sup>b</sup> (Z37.5-1970)	0.1 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup>		
Cadmium dust <sup>b</sup> (Z37.5-1970)	0.2 mg/m <sup>3</sup>	0.6 mg/m <sup>3</sup>		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 min
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min in any 4 h
Chromic acid and chromates (Z37-7-1971)		1 mg/10 m <sup>3</sup>		
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 min
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min in any 3 h
Fluoride as dust (Z37.28-1969)	2.5 mg/m <sup>3</sup>			
Formaldehyde: see 1910.1048				
Hydrogen fluoride (Z37.28-1969)	3 ppm			
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 min once only if no other measurable exposure occurs
Mercury (Z37.8-1971)		1 mg/10m <sup>3</sup>		
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min in any 3 h
Methylene chloride (Z37.23-1969)	500 ppm	1000 ppm	2000 ppm	5 min in any 2 h
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg/m <sup>3</sup>	0.04 mg/m <sup>3</sup>		
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min in any 3 h
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min in any 3 h
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 min
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min in any 2 h

<sup>a</sup> This standard applies to the industry segments exempted from the 1 ppm 8-h TWA and 5 ppm STEL of the benzene standard (29 CFR 1910.1028)

<sup>b</sup> This standard applies to any operations or sectors for which the cadmium standard, 29 CFR 1910.1027, is stayed or otherwise not in effect.



# Appendix 24-3

## Mineral Dusts (29 CFR 1910.1000, Table Z-3)

Substance	mppcf <sup>a</sup>	mg/m <sup>3</sup>
Silica:		
Crystalline		
Quartz (Respirable)	250 <sup>b</sup> %SiO <sub>2</sub> + 5	10 mg/m <sup>3</sup> %SiO <sub>2</sub> + 2
Quartz (Total dust)		30 mg/m <sup>3</sup> %SiO <sub>2</sub> + 2
Cristobalite: Use 1/2 the value calculated from the count or mass formulae for quartz		
Tridymite: Use 1/2 the value calculated from the formulae for quartz		
Amorphous, including natural diatomaceous earth	20	80 mg/m <sup>3</sup> %SiO <sub>2</sub>
Silicates (less than 1 percent crystalline silica):		
Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20 <sup>c</sup>	
Talc (containing asbestos) - Use asbestos limit.		
Tremolite, asbestiform (see 29 CFR 1910.1001).	50	
Portland cement	15	
Graphite (natural)		
Coal Dust:		2.4 mg/m <sup>3</sup> <sup>e</sup>
Respirable fraction less than 5 percent SiO <sub>2</sub>	.....	%SiO <sub>2</sub> + 2
Respirable fraction greater than 5 percent SiO <sub>2</sub>	.....	10 mg/m <sup>3</sup> <sup>e</sup> %SiO <sub>2</sub> + 2
Inert or Nuisance Dust: <sup>d</sup>		
Respirable fraction less than 5 percent SiO <sub>2</sub>	15	5 mg/m <sup>3</sup>
Total dust	50	15 mg/m <sup>3</sup>

<sup>a</sup> Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.  
(NOTE: The conversion factor for mppcf is:  $mppcf \times 35.3 = \text{million particles per cubic meter} = \text{particles/cc.}$ )

<sup>b</sup> The percentage of crystalline silica in the formula is the amount determined from airborne samples except in those instances in which other methods have been shown to be applicable.

<sup>c</sup> Containing less than 1 percent quartz; if 1 percent quartz or more, use quartz limit.

<sup>d</sup> All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name, are covered by this limit, which is the same as the PNOR limit in Appendix 24-1.

\* Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

<b>Aerodynamic diameter (unit density sphere)</b>	<b>Percent Passing Selector</b>
2	90
2.5	75
3.5	50
5.0	25
10	0

These measurements refer to the use of an Atomic Energy Commission (AEC) (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of  $2.4 \text{ mg/m}^3$  [58 Federal Register (FR) 35340, 30 June 1993, 40191, 27 July 1993].

## **CHAPTER 25**

### **ASBESTOS**

## CHAPTER 25

### EOH: ASBESTOS

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Action Level (AL)* - an airborne concentration of asbestos of 0.1 fiber per cubic centimeter (f/cc) of air calculated as an 8-h TWA (29 CFR 1910.1001(b)).
- *Asbestos* - the term is understood to include chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered (29 CFR 1910.1001(b)).
- *Asbestos-Containing Material (ACM)* - any material containing more than 1 percent asbestos (29 CFR 1910.1001(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1001(b)).
- *Authorized Person* - any person authorized by the employer and required by work duties to be present in regulated areas (29 CFR 1910.1001(b)).
- *Certified Industrial Hygienist (CIS)* - one certified in the practice of industrial hygiene by the American Board of Industrial Hygiene (29 CFR 1910.1001(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1001(b)).
- *Employee Exposure* - that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment (29 CFR 1910.1001(b)).
- *Excursion Limit* - an airborne concentration of asbestos equaling 1.0 f/cc as averaged over a sampling period of 30 min (29 CFR 1910.1001(c)).
- *Fiber* - a particulate form of asbestos 5  $\mu$ m or longer, with a length-to-diameter ratio of at least 3 to 1 (29 CFR 1910.1001(b)).
- *Filtering Face Piece Device* - a respirator that has a face piece made entirely of filtering or adsorbing material. These respirators do not have changeable filters or cartridges. The device does not have an inhalation valve, and it may or may not have an exhalation valve (AFOSH STD 48-1, Attachment 1, Section C).
- *High-Efficiency Particulate Air (HEPA) Filter* - a filter capable of trapping and retaining at least 99.97 percent of 0.3  $\mu$ m diameter mono-dispersed particles (29 CFR 1910.1001(b)).
- *Homogeneous Area* - an area of surfacing material or thermal system insulation (TSI) that is uniform in color and texture (29 CFR 1910.1001(b)).
- *Industrial Hygienist* - a professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards (29 CFR 1910.1001(b)).

- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. for each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8 h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).
- *Personnel Exposure* - the exposure to airborne asbestos that would occur if an individual were not using respiratory protective equipment (29 CFR 1910.1001(b)).
- *Presumed Asbestos-Containing Material (PACM)* - thermal system insulation and surfacing material found in buildings constructed no later than 1980. The designation of a material as PACM may be rebutted pursuant to 29 CFR 1910.1001(j)(8) (29 CFR 1910.1001(b)).
- *Regulated Area* - an area established by the installation to demarcate areas where airborne concentrations of asbestos exceed, or can reasonably be expected to exceed, the OEL (29 CFR 1910.1001(b)).
- *Surfacing ACM* - surfacing material that contains more than 1 percent asbestos (29 CFR 1910.1001(b)).
- *Surfacing Material* - material that is sprayed, troweled on, or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes) (29 CFR 1910.1001(b)).
- *Thermal System Insulation (TSI)* - ACM applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain (29 CFR 1910.1001(b)).
- *Thermal System Insulation ACM* - TSI that contains more than one percent asbestos (29 CFR 1910.1001(b)).

**EOH: ASBESTOS**

**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Occupational Exposure Limits (OELs)	AS.10.1	25-5
Exposure Monitoring	AS.20.1 through AS.20.5	25-7
Regulated Areas	AS.30.1 through AS.30.3	25-9
Methods of Compliance	AS.40.1 through AS.40.10	25-11
Respiratory Protection	AS.50.1 through AS.50.6	25-15
Protective Work Clothing and Equipment	AS.60.1 through AS.60.4	25-17
Hygiene Facilities and Practices	AS.70.1	25-19
Hazard Communication	AS.80.1 through AS.80.15	25-21
Housekeeping	AS.90.1 through AS.90.3	25-27
Medical Surveillance	AS.100.1 through AS.100.7	25-29
Recordkeeping	AS.110.1 through AS.110.7	25-33
Observation of Monitoring	AS.120.1 and AS.120.2	25-35

  

Appendix 25-1. <i>Respiratory Protection for Asbestos Fibers</i>	25-37
Appendix 25-2. <i>Frequency of Chest Roentgenogram</i>	25-39



**COMPLIANCE CATEGORY:**  
**EOH: ASBESTOS**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>AS.10 OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>AS.10.1.</b> Installations must ensure that no personnel are exposed to an airborne concentration of asbestos in excess of certain limits (29 CFR 1910.1001(c)(1) and (c)(2)).</p>	<p>(NOTE: AFOSH STD 48-8, <i>Controlling Exposures to Hazardous Substances</i>, requires the use of the most recent Threshold Limit Values published in <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (which is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.)</p> <p>Verify that no personnel are exposed to an airborne concentration of asbestos in excess of 0.1 f/cc as an 8-h TWA as determined by the OSHA Reference Method or an equivalent method.</p> <p>Verify that no personnel are exposed to an airborne concentration of asbestos in excess of 1.0 f/cc as averaged over a sampling period of 30 min (excursion limit) as determined by the OSHA Reference Method or an equivalent method.</p>



**COMPLIANCE CATEGORY:**  
**EOH: ASBESTOS**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>AS.20 EXPOSURE MONITORING</b></p> <p><b>AS.20.1.</b> Installations must conduct initial monitoring of personnel under certain circumstances (29 CFR 1910.1001(d)(2) and (o)(3)(i)).</p> <p><b>AS.20.2.</b> Installations must meet specific requirements with regard to the frequency of monitoring (29 CFR 1910.1001(d)(3) and (d)(4)).</p>	<p>Determine whether the installation has workplaces covered by 29 CFR 1910.1001.</p> <p>Verify that the installation performs initial monitoring of personnel who are, or may reasonably be expected to be, exposed to airborne concentrations at or above the TWA permissible exposure limit and/or excursion limit.</p> <p>(NOTE: Initial monitoring must be completed as soon as possible, but no later than 1 October 1995.)</p> <p>(NOTE: Where the installation has monitored after 31 March 1992, for the TWA permissible exposure limit and/or the excursion limit, and the monitoring satisfies all other requirements of 29 CFR 1910.1001, the installation may rely on such earlier monitoring results to satisfy this requirement.)</p> <p>(NOTE: Where the installation has relied upon objective data that demonstrates that asbestos is not capable of being released in airborne concentrations at or above the TWA permissible exposure level and/or excursion limit under the expected conditions of processing, use, or handling, then no initial monitoring is required.)</p> <p>Verify that, after the initial monitoring, the installation monitors at such frequency and in such a pattern as to represent with reasonable accuracy the levels of exposure of its personnel.</p> <p>Verify that the sampling is never at intervals greater than 6 mo for personnel whose exposures may reasonably be foreseen to exceed the TWA permissible exposure level and/or excursion limit.</p> <p>(NOTE: If statistics from either the initial or the periodic monitoring indicate that personnel exposures are below the TWA permissible exposure limit and/or excursion limit, the installation may discontinue the monitoring for those personnel whose exposures are represented by such monitoring.)</p>

<b>COMPLIANCE CATEGORY:</b> <b>EOH: ASBESTOS</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>AS.20.3.</b> In addition to periodic monitoring, exposure monitoring must be carried out whenever certain conditions arise (29 CFR 1910.1001(d) (5)).</p>	<p>Verify that the installation carries out exposure monitoring:</p> <ul style="list-style-type: none"> <li>- whenever there has been a change in the production, process, control equipment, personnel, or work practices that may result in new or additional exposures above the TWA permissible exposure limit and/or excursion limit</li> <li>- whenever there is any reason to suspect that a change may result in new or additional exposures above the OEL and/or excursion limit.</li> </ul>
<p><b>AS.20.4.</b> Methods of monitoring and evaluation of results must meet specific requirements (29 CFR 1910.1001(d)(6)).</p>	<p>Verify that all samples taken to satisfy monitoring requirements are personal samples collected following the procedures specified in Appendix A to 29 CFR 1910.1001.</p> <p>Verify that all samples taken to satisfy monitoring requirements are evaluated using the ORM specified in Appendix A to 29 CFR 1910.1001, or an equivalent counting method.</p> <p>Verify that, if a method equivalent to the ORM is used, the method meets the following criteria:</p> <ul style="list-style-type: none"> <li>- replicate exposure data used to establish equivalency are collected in side-by-side field and laboratory comparisons</li> <li>- the comparison indicates that 90 percent of the samples collected in the range 0.5 to 2.0 times the permissible limit have an accuracy range of plus or minus 25 percent of the ORM results with a 95 percent confidence level as demonstrated by a statistically valid protocol</li> <li>- the equivalent method is documented and the results of the comparison testing are maintained.</li> </ul> <p>Verify that the installation uses the results of monitoring analysis performed by laboratories that have instituted quality assurance programs that include the elements prescribed in Appendix A to 29 CFR 1910.1001.</p>
<p><b>AS.20.5.</b> Installations must notify affected personnel of the results of monitoring (29 CFR 1910.1001(d)(7)).</p>	<p>Verify that the installation notifies the affected personnel in writing of the results either individually or by posting of results in an appropriate location that is accessible to affected personnel.</p> <p>Verify that such notification takes place within 15 working days after the receipt of the results of the monitoring.</p> <p>Verify that, wherever monitoring results indicated that the TWA and/or excursion limit have been exceeded, the written notification contains the corrective action being taken by the installation to reduce personnel exposure to or below the TWA and/or excursion limit.</p>

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<p><b>AS.30</b>  <b>REGULATED AREAS</b></p> <p><b>AS.30.1.</b> Installations must establish regulated areas in certain circumstances (29 CFR 1910.1001(e)(1) through (e)(3) and (o)(3)(ii)).</p> <p><b>AS.30.2.</b> Respirators that meet certain standards must be used in regulated areas (29 CFR 1910.1001(e)(4)).</p> <p><b>AS.30.3.</b> Certain activities are prohibited in regulated areas (29 CFR 1910.1001 (e)(5)).</p>	<p>Verify that the installation establishes regulated areas wherever airborne concentrations of asbestos are in excess of the TWA and/or excursion limit.</p> <p>(NOTE: The regulated areas required by this section must be set up as soon as possible after the results of initial monitoring are known and not later than 1 October 1995.)</p> <p>Verify that regulated areas are demarcated from the rest of the workplace in any manner that minimizes the number of persons who will be exposed to asbestos.</p> <p>Verify that access to regulated areas is limited to authorized persons or to persons authorized by the <i>OSHA Act</i> or regulations issued pursuant to it.</p> <p>Verify that persons entering regulated areas are supplied with and wear respirators selected in accordance with the requirements of 29 CFR 1910.1001(g)(2) (see check-list items AS.50.2 and AS.50.3).</p> <p>Verify that personnel do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.</p>



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<p><b>AS.40</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>AS.40.1.</b> Installations must institute engineering controls and work practices that reduce personnel exposure to or below certain levels (29 CFR 1910.1001(f)(1)(i) and (f)(1)(ii)).</p> <p><b>AS.40.2.</b> Installations must comply with certain requirements for specific operations (29 CFR 1910.1001(f)(1)(iii)).</p>	<p>Verify that the installation institutes engineering controls and work practices to reduce and maintain personnel exposure to or below the TWA and/or excursion limit.</p> <p>(NOTE: This requirement does not apply to the extent that such controls are not feasible.)</p> <p>Determine whether the feasible engineering controls and work practices that can be instituted are not sufficient to reduce personnel exposure to or below the TWA and/or excursion limit.</p> <p>Verify that, in such cases, the installation:</p> <ul style="list-style-type: none"> <li>- uses feasible engineering controls and work practices to reduce personnel exposure to the lowest levels achievable by these controls</li> <li>- supplements these controls by the use of respiratory protection that complies with the requirements of 1910.1001(g) (see the checklist items in AS.50).</li> </ul> <p>(NOTE: This checklist item applies only to the following operations:</p> <ul style="list-style-type: none"> <li>- coupling cut-off in primary asbestos cement pipe manufacturing</li> <li>- sanding in primary and secondary asbestos cement sheet manufacturing</li> <li>- grinding in primary and secondary friction product manufacturing</li> <li>- carding and spinning in dry textile processes</li> <li>- grinding and sanding in primary plastics manufacturing.)</li> </ul> <p>Determine whether the feasible engineering controls and work practices that can be instituted are not sufficient to reduce personnel exposure to or below the TWA and/or excursion limit.</p> <p>Verify that, in such cases, the installation:</p> <ul style="list-style-type: none"> <li>- uses feasible engineering controls and work practices to reduce personnel exposure to or below: <ul style="list-style-type: none"> <li>- 0.5 f/cc of air (as an 8-h time-weighted average)</li> <li>- 2.5 f/cc for 30 min (short-term exposure)</li> </ul> </li> <li>- supplements these controls and practices by the use of any combination of respiratory protection that complies with the requirements of 1910.1001(g) (see the checklist items in AS.50).</li> </ul>

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<b>AS.40.3.</b> Certain hand-operated or power tools must be provided with local exhaust ventilation systems (29 CFR 1910.1001(f)(1)(v)).	Verify that all hand-operated and power-operated tools that would produce or release fibers of asbestos so as to expose personnel to levels in excess of the TWA and/or excursion limit are provided with local exhaust ventilation systems.  (NOTE: Examples of such tools are saws, scorers, abrasive wheels, and drills.)
<b>AS.40.4.</b> Local exhaust ventilation and dust collection systems are subject to specific requirements (29 CFR 1910.1001 (f)(1)(iv)).	Verify that the local exhaust ventilation systems comply with the requirements of 29 CFR 1910.1001(f)(1)(iv) (see checklist item AS.40.4).  Verify that local exhaust ventilation and dust collection systems are designed, constructed, installed, and maintained in accordance with good practices.  (NOTE: Such good practices may be found in the <i>American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems</i> , ANSI Z9.2-1979.)
<b>AS.40.5.</b> Asbestos must, insofar as practicable, be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state (29 CFR 1910.1001(f)(1)(vi)).	Verify that, insofar as is practicable, asbestos is handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the TWA and/or excursion limit.  (NOTE: This requirement does not apply if the usefulness of the product would be diminished by use of wet methods.)
<b>AS.40.6.</b> Certain particular products are subject to special handling requirements (29 CFR 1910.1001(f)(1) (viii)).	Verify that no asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos, is removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated in such a way as to prevent effectively the release of airborne fibers of asbestos.
<b>AS.40.7.</b> Compressed air must not be used to remove asbestos or materials that contain asbestos (29 CFR 1910.1001(f)(1) (ix)).	Verify that compressed air is not used to remove asbestos or materials containing asbestos.  (NOTE: This requirement does not apply if the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.)
<b>AS.40.8.</b> Installations must develop and implement compliance programs under certain circumstances (29 CFR 1910.1001(f)(2)(i) through (f)(2)(iii) and (o)(3)(vii)).	Determine whether the TWA and/or excursion limit is exceeded on the installation.  Verify that the installation establishes and implements a written program to reduce personnel exposure to or below the TWA and to or below the excursion limit by means of engineering and work practice controls and by the use of respiratory protection where required or permitted.  Verify that the compliance program is reviewed and updated as necessary to reflect significant changes in the status of the installation's compliance program.

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<p><b>AS.40.9.</b> Rotation of personnel may not be used as a means of compliance (29 CFR 1910.1001(f)(2) (iv)).</p> <p><b>AS.40.10.</b> Installations must enforce engineering controls and work practices for brake and clutch repair and service (29 CFR 1910.1001(f)(3)).</p>	<p>Verify that the written program is submitted upon request for examination and copying to the Assistant Secretary, the Director, affected personnel, and their designated representatives.</p> <p>(NOTE: Required written compliance programs must be completed and available for inspection and copying as soon as possible but no later than 1 October 1995.)</p> <p>Verify that the installation does not use rotation of personnel as a means of compliance with the TWA and/or excursion limit.</p> <p>Verify that, during automotive brake and clutch inspection, disassembly, repair, and assembly operations, the installation institutes engineering controls and work practices to reduce employee exposure to materials containing asbestos by either:</p> <ul style="list-style-type: none"> <li>- using a negative pressure enclosure/HEPA vacuum system method or low pressure/wet cleaning method that meets the requirements set out in Appendix F to 29 CFR 1910.1001</li> <li>- using an equivalent method that follows written procedures that the installation demonstrates can achieve results equivalent to Method A in Appendix F to 29 CFR 1910.1001.</li> </ul> <p>(NOTE: For facilities in which no more than five pair of brakes or five clutches are inspected, disassembled, repaired, or assembled per week, the method set forth in paragraph [D] of Appendix F of 29 CFR 1910.1001 may be used.)</p> <p>(NOTE: The installation may also comply by using an equivalent method that follows written procedures that the installation demonstrates can achieve equivalent exposure reductions. Such demonstration must include monitoring data conducted under workplace conditions closely resembling the process, type of asbestos containing materials, control method, work practices, and environmental conditions under which the equivalent method will be used, or objective data, which document that under all reasonably foreseeable conditions of brake and clutch repair applications, the method results in exposures that are equivalent to the methods set out in Appendix F to 29 CFR 1910.1001.)</p>



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<p><b>AS.50 RESPIRATORY PROTECTION</b></p> <p><b>AS.50.1.</b> Installations must provide and ensure the use of respirators under certain circumstances (29 CFR 1910.1001(g)(1) and (o)(3)(iii)).</p> <p><b>AS.50.2.</b> Installations must select appropriate respirators in accordance with specific criteria (29 CFR 1910.1001(g)(2)(i)).</p> <p><b>AS.50.3.</b> Installations must provide powered, air-purifying respirators under certain circumstances (29 CFR 1910.1001(g)(2)(ii)).</p> <p><b>AS.50.4.</b> Installations where respiratory protection must be used are required to institute a respiratory protection program (29 CFR 1910.1001(g)(3)(i)).</p>	<p>Verify that the installation provides and ensures the use of respirators in the following circumstances:</p> <ul style="list-style-type: none"> <li>- during the interval necessary to install or implement feasible engineering and work practice controls</li> <li>- in work operations, such as maintenance and repair activities, or other activities for which engineering and work practice controls are not feasible</li> <li>- in work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the TWA and/or excursion limit</li> <li>- in emergencies.</li> </ul> <p>(NOTE: Respiratory protection required under the provisions of this checklist item must be provided as soon as possible but no later than 1 October 1995.)</p> <p>Verify that the installation selects appropriate respirators in accordance with Appendix 25-1.</p> <p>Verify that respirators are selected from among those jointly approved as being acceptable for protection by MSHA and by NIOSH under the provisions of 30 CFR 11.</p> <p>Verify that respirators are provided at no cost to personnel.</p> <p>Verify that the installation provides a tight-fitting powered, air-purifying respirator in lieu of any negative pressure respirator specified in Appendix 25-1 whenever:</p> <ul style="list-style-type: none"> <li>- an individual chooses to use this type of respirator</li> <li>- this respirator will provide adequate protection to the individual.</li> </ul> <p>Determine whether respiratory protection must be used on the installation.</p> <p>Verify that the installation has instituted a respiratory protection program.</p> <p>Verify that the installation's respiratory protection program meets the requirements of 29 CFR 1910.134(b), (d), (e) and (f) (see checklist items PE.30.4, PE.30.5, PE.30.7, PE.30.9, PE.40.2, PE.60.1 through PE.60.3, PE.60.7, PE.70.2, PE.70.4, PE.80.1, PE.100.1, PE.100.3 through PE.100.6, PE.100.9 through PE.100.12).</p>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>EOH: ASBESTOS</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
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<p><b>AS.50.5.</b> Installations have specific responsibilities with regard to personnel who wear respirators (29 CFR 1910.1001 (g)(3)(ii) through (g)(3)(iv)).</p>	<p>Verify that the installation permits each individual who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected.</p> <p>Verify that the installation maintains an adequate supply of filter elements for this purpose.</p> <p>Verify that personnel who wear respirators are permitted to leave the regulated area to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.</p> <p>Verify that no individual is assigned to tasks requiring the use of respirators if, based upon his or her most recent examination, an examining physician determines that the individual will be unable to function normally wearing a respirator, or that the safety or health of the individual or other personnel will be impaired by the use of a respirator.</p> <p>Verify that such an individual is assigned to another job or given the opportunity to transfer to a different position whose duties he or she is able to perform with the same seniority, status, and rate of pay the individual had just prior to such transfer, if such a different position is available.</p>
<p><b>AS.50.6.</b> Installations must provide respirator fit testing (29 CFR 1910.1001(g)(4)).</p>	<p>Verify that respirators issued to the personnel exhibit the least possible facepiece leakage and that the respirators are fitted properly.</p> <p>Verify that, for each individual wearing negative pressure respirators, the installation performs either quantitative or qualitative face fit tests at the time of initial fitting and at least every 6 mo thereafter.</p> <p>(NOTE: The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn.)</p> <p>Verify that qualitative fit tests are conducted in accordance with Appendix C to 29 CFR 1910.1001.</p> <p>(NOTE: The tests are used to select facepieces that provide the required protection as prescribed in Appendix 25-1.)</p>

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<p><b>AS.60</b>  <b>PROTECTIVE WORK CLOTHING AND EQUIPMENT</b></p> <p><b>AS.60.1.</b> Installations must provide appropriate work clothing and equipment under certain circumstances (29 CFR 1910.1001(h)(1)).</p> <p><b>AS.60.2.</b> Installations must ensure that work clothing contaminated with asbestos is removed in certain change rooms only (29 CFR 1910.1001 (h)(2)(i)).</p> <p><b>AS.60.3.</b> Installations must meet certain requirements with regard to contaminated work clothing (29 CFR 1910.1001(h)(2)(ii) through (h)(2)(iv)).</p>	<p>Verify that the installation provides, at no cost to the employee, and ensures the use of protective clothing and equipment in the following circumstances:</p> <ul style="list-style-type: none"> <li>- if an individual is exposed to asbestos above the TWA and/or excursion limit, or</li> <li>- where the possibility of eye irritation exists.</li> </ul> <p>(NOTE: Protective clothing includes, but is not limited to, the following:</p> <ul style="list-style-type: none"> <li>- coveralls or similar full-body work clothing</li> <li>- gloves, head coverings, and foot coverings</li> <li>- face shields, vented goggles, or other appropriate protective equipment that complies with the provisions of 29 CFR 1910.133 (see the checklist items in PE.20).)</li> </ul> <p>Verify that work clothing contaminated with asbestos is removed only in change rooms that comply with the provisions of 29 CFR 1910.1001(i)(1) (see checklist item AS.70.1).</p> <p>Verify that the installation ensures that no personnel take contaminated work clothing out of the change room.</p> <p>(NOTE: This requirement does not apply to those personnel authorized to remove contaminated work clothing for the purpose of laundering, maintenance, or disposal.)</p> <p>Verify that contaminated work clothing is placed and stored in closed containers that prevent dispersion of the asbestos outside the container.</p> <p>Verify that containers of contaminated protective devices or work clothing that are to be taken out of change rooms or the workplace for cleaning, maintenance, or disposal bear labels in accordance with 29 CFR 1910.1001(j)(4) (see checklist items AS.80.10 and AS.80.11).</p>

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<b>AS.60.4.</b> Installations must meet certain requirements with regard to cleaning and replacement of work clothing (29 CFR 1910.1001 (h)(3)).	<p>Verify that the installation cleans, launders, repairs, or replaces required protective clothing and equipment to maintain their effectiveness.</p> <p>Verify that the installation provides clean protective clothing and equipment at least weekly to each affected individual.</p> <p>Verify that the installation prohibits the removal of asbestos from protective clothing and equipment by blowing or shaking.</p> <p>Verify that laundering of contaminated clothing is done so as to prevent the release of airborne fibers of asbestos in excess of the prescribed OELs.</p> <p>Verify that any installation that gives contaminated clothing to another person for laundering informs such person of the requirement to effectively prevent the release of airborne fibers of asbestos in excess of the OELs.</p> <p>Verify that the installation informs any person who launders or cleans protective clothing or equipment contaminated with asbestos of the potentially harmful effects of exposure to asbestos.</p> <p>Verify that contaminated clothing is transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with 29 CFR 1910.1001(j) (see checklist items AS.80.10 and AS.80.11).</p>

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<p><b>AS.70</b>  <b>HYGIENE FACILITIES AND PRACTICES</b></p> <p><b>AS.70.1.</b> Installations must meet specific requirements with regard to hygiene facilities and practices (29 CFR 1910.1001(i) and (o)(3)(iv)).</p>	<p>Verify that the installation provides clean change rooms for personnel who work in areas where their airborne exposure to asbestos is above the TWA and/or excursion limit.</p> <p>Verify that change rooms are in accordance with the requirements of 29 CFR 1910.141(e), and that they are equipped with two separate lockers or storage facilities, so separated as to prevent contamination of the individual's street clothes from his protective work clothing and equipment.</p> <p>Verify that personnel who work in areas where their airborne exposure is above the TWA and/or excursion limit shower at the end of the work shift.</p> <p>Verify that one shower is provided for each 10 individuals of each sex, or numerical fraction thereof, who are required to shower during the same shift.</p> <p>Verify that the installation provides shower facilities with body soap or other appropriate cleansing agents located convenient to the showers.</p> <p>Verify that showers are provided with hot and cold water feeding from a common discharge line.</p> <p>Verify that personnel who use showers are provided with individual clean towels.</p> <p>Verify that the installation ensures that personnel who are required to shower do not leave the workplace wearing any clothing or equipment worn during the work shift.</p> <p>Verify that the installation provides lunchroom facilities for personnel who work in areas where their airborne exposure is above the TWA and/or excursion limit.</p> <p>Verify that the installation ensures that lunchroom facilities have a positive pressure, filtered air supply, and are readily accessible to personnel.</p> <p>Verify that the installation ensures that personnel who work in areas where their air borne exposure is above the OEL and/or excursion limit wash their hands and faces prior to eating, drinking, or smoking.</p>

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	<p>Verify that the installation ensures that personnel do not enter lunchroom facilities with protective work clothing or equipment unless surface asbestos fibers have been removed from the clothing or equipment by vacuuming or other method that removes dust without causing the asbestos to become airborne.</p> <p>Verify that the installation ensures that personnel do not smoke in work areas where they are occupationally exposed to asbestos.</p> <p>(NOTE: Construction plans for change rooms, showers, lavatories, and lunchroom facilities must be completed as soon as possible but not later than 1 October 1995.)</p>

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<p><b>AS.80 HAZARD COMMUNICATION</b></p> <p><b>AS.80.1.</b> Installations must treat certain materials as ACM (29 CFR 1910.1001 (j)(1) and (j)(8)).</p> <p><b>AS.80.2.</b> Installations attempting to demonstrate that PACM does not contain ACM must meet specific requirements (29 CFR 1910.1001(j)(8)(ii)).</p>	<p>NOTE: Employee information and training must be provided as soon as possible but not later than 1 October 1995.)</p> <p>Verify that the installation treats installed TSI and sprayed on and troweled on surfacing materials as ACM in buildings constructed no later than 1980.</p> <p>(NOTE: These materials are designated presumed ACM or PACM.)</p> <p>Verify that asphalt and vinyl flooring material installed no later than 1980 are treated as ACM.</p> <p>(NOTE: For the purposes of hazard communication, an installation may demonstrate that PACM and flooring material do not contain asbestos by:</p> <ul style="list-style-type: none"><li>- having a completed inspection conducted pursuant to the <i>Asbestos Hazard Emergency Response Act</i> (AHERA) which demonstrates that no ACM is present), or</li><li>- performing tests of the material containing PACM which demonstrate that no ACM is present</li><li>- showing that flooring material (including associated mastic and backing) does not contain asbestos, based on determination by an industrial hygienist using recognized analytical techniques that show that the material is not ACM.)</li></ul> <p>Verify that tests intended to demonstrate that no ACM is present include analysis of bulk samples collected in accordance with 40 CFR 736.86.</p> <p>Verify that the test evaluation and sample collection are conducted by an accredited inspector or by a CIH.</p> <p>Verify that analysis is performed by persons or laboratories with proficiency demonstrated by successful participation in a nationally recognized testing program such as one of the following:</p> <ul style="list-style-type: none"><li>- the National Voluntary Laboratory Accreditation Program</li><li>- the National Institute for Standards and Technology</li><li>- the Round Robin for bulk samples sponsored by the American Industrial Hygiene Association or an equivalent nationally recognized round robin testing program.</li></ul>

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<b>AS.80.3.</b> Installations must be diligent in informing personnel about the presence and location of ACM and PACM (29 CFR 1910.1001 (j)(2)(i)).	<p>Verify that building and facility owners determine the presence, location, and quantity of ACM and/or PACM at the work site.</p> <p>Verify that the installation exercises due diligence in informing employers and employees about the presence and location of ACM and PACM.</p>
<b>AS.80.4.</b> Installations must maintain records concerning the presence and location of ACM and PACM (29 CFR 1910.1001(j)(2)(ii)).	<p>Verify that the installation maintains records of all information required by 29 CFR 1910.1001 and/or otherwise known to the installation concerning the presence, location, and quantity of ACM and PACM in the building/facility.</p> <p>Verify that the records are kept for the duration of ownership and are transferred to successive owners.</p>
<b>AS.80.5.</b> Installations must inform personnel who perform housekeeping activities in areas that contain ACM and/or PACM of the presence and location of ACM and PACM (29 CFR 1910.1001(j)(2)(iii)).	<p>Verify that the installation informs employers of personnel who perform housekeeping activities in areas that contain ACM and/or PACM of the presence and location of ACM and/or PACM in such areas.</p> <p>Verify that employers relay the information provided by the installation directly to the housekeeping personnel.</p>
<b>AS.80.6.</b> Warning signs must be provided and displayed in certain areas (29 CFR 1910.1001(j)(3)(i)).	<p>Verify that the installation provides warning signs and displays them at each regulated area.</p> <p>Verify that warning signs are posted at all approaches to regulated areas so that an individual may read the signs and take necessary protective steps before entering the area.</p>
<b>AS.80.7.</b> Required warning signs must bear specific information (29 CFR 1910.1001(j)(3)(ii)).	<p>Verify that warning signs bear the following legend:</p> <p style="text-align: center;"> <b>DANGER</b>  <b>ASBESTOS</b>  <b>CANCER AND LUNG DISEASE HAZARD.</b> </p> <p>Verify that, if respirators and protective clothing are required in the area, the following is added to the text of the warning sign:</p> <p style="text-align: center;"> <b>AUTHORIZED PERSONNEL ONLY</b>  <b>RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA.</b> </p>

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<p><b>AS.80.8.</b> Installations must ensure that personnel working in and contiguous to regulated areas comprehend the required warning signs (29 CFR 1910.1001(j)(3)(iv)).</p> <p><b>AS.80.9.</b> Signs that bear specific information must be posted at the entrance to certain mechanical rooms/ areas (29 CFR 1910.1001 (j)(3)(v)).</p> <p><b>AS.80.10.</b> Warning labels must be affixed to certain objects and rooms/ areas (29 CFR 1910.1001(j)(4)(i)).</p>	<p>Verify that installations ensure that personnel working in and contiguous to regulated areas comprehend the required warning signs.</p> <p>(NOTE: Means to ensure comprehension may include the use of foreign languages, pictographs, and graphics.)</p> <p>Determine whether the installation has mechanical rooms/areas in which employees can reasonably be expected to enter and which contain ACM and/or PACM.</p> <p>Verify that such the installation posts signs that identify:</p> <ul style="list-style-type: none"> <li>- the material which is present</li> <li>- the location of the material</li> <li>- appropriate work practices which, if followed, will ensure that ACM and/or PACM will not be disturbed.</li> </ul> <p>Verify that the installation ensures, to the extent feasible, that employees who come in contact with these signs can comprehend them.</p> <p>(NOTE: Means to ensure employee comprehension include the use of foreign languages, pictographs, graphics, and awareness training.</p> <p>Verify that warning labels are affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers.</p> <p>Verify that, when a building owner or employer identifies previously installed ACM and/or PACM, labels or signs are affixed or posted so that employees will be notified of what materials contain ACM and/or PACM.</p> <p>Verify that the employer attaches such labels in areas where they will clearly be noticed by employees who are likely to be exposed, such as at the entrance to mechanical rooms/areas.</p> <p>(NOTE: Signs required by 29 CFR 1910.1001(j)(3) may be posted in lieu of labels, so long as they contain information required for labeling.)</p> <p>(NOTE: The intent of these requirements is to warn any individual who might be disturbing the ACM and/or PACM. A label may be affixed to the ACM or PACM itself, or a sign may be posted on the door to the room that indicates which parts of the room contain ACM or PACM. The signs must be located in a place where an individual who was going to disturb the ACM/PACM for any reason would see them. Color coding may be used for pipes or similar structures. It is not sufficient simply to have a map of the facility that indicates where ACM/PACM is</p>

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	<p>located, nor is it sufficient simply to tell the employees where such material is located.)</p> <p>(NOTE: These provisions do not apply where:</p> <ul style="list-style-type: none"> <li>- asbestos fibers have been modified by a bonding agent, coating, binder, or other material, provided that the manufacturer can demonstrate that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentration of fibers of asbestos in excess of the TWA OEL and/or excursion limit will be released, or</li> <li>- asbestos is present in a product in concentrations less than one percent.)</li> </ul>
<p><b>AS.80.11.</b> Warning labels must be in compliance with specific requirements (29 CFR 1910.1001(j)(4)(ii)).</p>	<p>Verify that warning labels meet the requirements of 29 CFR 1910.1200(f) (see checklist items HC.40.1 through HC.40.3).</p> <p>Verify that warning labels include the following information:</p> <p style="text-align: center;"> <b>DANGER</b>  <b>CONTAINS ASBESTOS FIBERS</b>  <b>AVOID CREATING DUST</b>  <b>CANCER AND LUNG DISEASE HAZARD</b> </p>
<p><b>AS.80.12.</b> Installations must institute training programs for certain personnel (29 CFR 1910.1001(j)(7)(i) and (j)(7)(ii)).</p>	<p>Verify that the installation has instituted a training program for all personnel who are exposed to airborne concentrations of asbestos at or above the OEL and/or excursion limit.</p> <p>Verify that the installation ensures the participation of all such personnel in the program.</p> <p>Verify that training is provided prior to or at the time of initial assignment and at least annually thereafter.</p>
<p><b>AS.80.13.</b> Installations must meet specific requirements with regard to the manner and content of training (29 CFR 1910.1001(j)(7)(iii)).</p>	<p>Verify that the training is conducted in a manner that personnel are able to understand.</p> <p>Verify that each individual is informed of the following:</p> <ul style="list-style-type: none"> <li>- the health effects associated with asbestos exposure</li> <li>- the relationship between smoking and exposure to asbestos in producing lung cancer</li> <li>- the quantity, location, manner of use, release, and storage of asbestos, and the specific nature of operations that could result in exposure to asbestos</li> <li>- the engineering controls and work practices associated with the individual's job assignment</li> <li>- the specific procedures implemented to protect personnel from exposure to asbestos, such as appropriate work practices, emergency and cleanup procedures, and PPE to be used</li> </ul>

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<p><b>AS.80.14.</b> The installation must provide to certain personnel an asbestos awareness training course that contains specific elements (29 CFR 1910.1001(j)(7)(iv)).</p> <p><b>AS.80.15.</b> The installation must meet specific requirements with regard to access to information and training materials (29 CFR 1910.1001(j)(7)(v)).</p>	<ul style="list-style-type: none"> <li>- the purpose, proper use, and limitations of respirators and protective clothing</li> <li>- the purpose and a description of the medical surveillance program required by 29 CFR 1910.1001(l) (see checklist item AS.100.1)</li> <li>- the contents of 29 CFR 1910.1001 and its appendices</li> <li>- the names, addresses, and phone numbers of public health organizations that provide information, materials, and/or conduct programs concerning smoking cessation</li> <li>- the requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels.</li> </ul> <p>(NOTE: The installation may distribute the list of organizations contained in Appendix I to 29 CFR 1910.1001 as a way of complying with the requirement to provide the names, addresses, and phone numbers of public health organizations that provide information, materials, and/or conduct programs concerning smoking cessation.)</p> <p>Verify that the installation provides, at no cost, to personnel who perform house-keeping operations in an area that contains ACM or PACM, an asbestos awareness training course.</p> <p>Verify that each individual receives asbestos awareness training at least once a year.</p> <p>Verify that the asbestos awareness training course contains the following elements:</p> <ul style="list-style-type: none"> <li>- health effects of asbestos</li> <li>- locations of ACM and PACM in the building/facility</li> <li>- recognition of ACM and PACM damage and deterioration</li> <li>- requirements in 29 CFR 1910.1001 relating to housekeeping</li> <li>- proper response to fiber release episodes.</li> </ul> <p>Verify that the installation makes a copy of 29 CFR 1910.1001 and its appendices readily available without cost to all affected personnel.</p> <p>Verify that the installation provides, upon request, all materials relating to the information and training program to the Assistant Secretary and on the training program to the Assistant Secretary and the Director.</p> <p>Verify that the installation informs all personnel concerning the availability of self- help smoking cessation program material.</p>

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	Verify that, if requested by personnel, the installation distributes such material, consisting of NIH Publication No. 89-1647, or equivalent self-help material, that is approved or published by a public health organization listed in Appendix I to 29 CFR 1910.1001.

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<p><b>AS.90</b>  <b>HOUSEKEEPING</b></p> <p><b>AS.90.1.</b> Installations must meet specific house-keeping requirements (29 CFR 1910.1001(k)(1) through (k)(6)).</p> <p><b>AS.90.2.</b> Asbestos-containing flooring material must be cared for according to specific procedures (29 CFR 1910.1001(k) (7)).</p> <p><b>AS.90.3.</b> Waste and debris and accompanying dust in an area containing accessible ACM and/or PACM or visibly deteriorated ACM must not be dusted or swept dry, or vacuumed without using a HEPA filter (29 CFR 1910.1001(k)(8)).</p>	<p>Verify that all surfaces are maintained as free as practicable of ACM waste and debris and accompanying dust.</p> <p>Verify that all spills and sudden releases of material containing asbestos are cleaned up as soon as possible.</p> <p>Verify that surfaces contaminated with asbestos are not cleaned by the use of compressed air.</p> <p>Verify that HEPA-filtered vacuuming equipment is used for vacuuming asbestos containing waste and debris.</p> <p>Verify that vacuuming equipment is used and emptied in a manner that minimizes the reentry of asbestos into the workplace.</p> <p>Verify that shoveling, dry sweeping, and dry cleanup of asbestos are used only where vacuuming and/or wet cleaning are not feasible.</p> <p>Verify that waste, scrap, debris, bags, containers, equipment, and clothing contaminated with asbestos consigned for disposal, are collected and disposed of in sealed, impermeable bags, or other closed, impermeable containers.</p> <p>Verify that asbestos-containing flooring material receives proper care:</p> <ul style="list-style-type: none"> <li>- sanding of asbestos-containing flooring material is prohibited</li> <li>- stripping of finishes is conducted using low abrasion pads at speeds lower than 300 rpm and wet methods</li> <li>- burnishing or dry buffing may be performed only on asbestos-containing flooring that has sufficient finish so that the pad cannot contact the ACM.</li> </ul> <p>Verify that waste and debris and accompanying dust in an area containing accessible ACM and/or PACM or visibly deteriorated ACM is not dusted or swept dry, or vacuumed without using a HEPA filter.</p>



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<p><b>AS.100 MEDICAL SURVEILLANCE</b></p> <p><b>AS.100.1.</b> Installations must institute medical surveillance programs for certain personnel (29 CFR 1910.1001(l)(1)).</p> <p><b>AS.100.2.</b> Installations must make preplacement examinations available before assigning personnel to an occupation exposed to airborne concentrations of asbestos fibers (29 CFR 1910.1001(l)(2)).</p>	<p>(NOTE: No medical examination is required of any individual, if adequate records show that he/she has been examined in accordance with 29 CFR 1910.1001(l)(2) through 1910.1001(l)(4) (see checklist items AS.100.2 through AS.100.4) within the past 1-yr period.)</p> <p>(NOTE: A pre-employment medical examination required as a condition of employment by the installation may not be used by that installation to meet the requirements of this section, unless the cost of such examination is borne by the installation.)</p> <p>(NOTE: Medical surveillance not previously required must be provided as soon as possible but not later than 1 October 1995.)</p> <p>Verify that the installation has instituted a medical surveillance program for all personnel who are or will be exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit.</p> <p>Verify that all medical examinations and procedures are performed by or under the supervision of a licensed physician.</p> <p>Verify that all medical examinations and procedures are provided without cost to the individual and at a reasonable time and place.</p> <p>Verify that persons, other than licensed physicians, who administer the required pulmonary function testing have completed a training course in spirometry sponsored by an appropriate academic or professional institution.</p> <p>Verify that, before an individual is assigned to an occupation exposed to airborne concentrations of asbestos fibers at or above the TWA and/or excursion limit, the installation provides or makes available a preplacement medical examination.</p> <p>Verify that the preplacement examination includes the following, at a minimum:</p> <ul style="list-style-type: none"> <li>- a medical and work history</li> <li>- a complete physical examination of all systems with emphasis on the respiratory system, the cardiovascular system, and digestive tract</li> <li>- completion of the respiratory disease standardized questionnaire found in Appendix D, Part 1 of 29 CFR 1910.1001</li> <li>- a chest roentgenogram (posterior-anterior 14 x 17 in. [35.56 x 43.18 cm])</li> <li>- pulmonary function tests to include FVC and at 1 s FEV(1.0)</li> <li>- any additional tests deemed appropriate by the examining physician.</li> </ul> <p>Verify that interpretation and classification of chest roentgenogram are conducted in accordance with Appendix E to 29 CFR 1910.1001.</p>

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<b>AS.100.3.</b> Installations must make periodic examinations available annually (29 CFR 1910.1001(l)(3)).	<p>Verify that the installation makes periodic examinations available annually.</p> <p>Verify that the scope of the medical examination meets the requirements of 29 CFR 1910.1001(l)(2)(ii) (see checklist item AS.100.2).</p> <p>Verify that the frequency of chest roentgenogram is in accordance with Appendix 25-2.</p> <p>Verify that the abbreviated standardized questionnaire contained in Appendix D, Part 2 to 29 CFR 1910.1001 is administered to the individual.</p>
<b>AS.100.4.</b> Installations must make medical examinations available to certain individuals at termination of employment (29 CFR 1910.1001(l)(4)).	<p>Verify that the installation provides, or makes available, a termination of employment medical examination to any individual who has been exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit.</p> <p>Verify that the medical examination is in accordance with the requirements for the periodic examinations stipulated in 29 CFR 1910.1001(l)(3) (see checklist item AS.100.3).</p> <p>Verify that the examination is given within 30 calendar days before or after the date of termination of employment.</p>
<b>AS.100.5.</b> Installations must provide certain information to examining physicians (29 CFR 1910.1001(l)(6)).	<p>Verify that the installation provides the following information to the examining physician:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1001 and Appendices D and E</li> <li>- a description of the affected individual's duties as they relate to his/her exposure</li> <li>- the individual's representative exposure level or anticipated exposure level</li> <li>- a description of any personal protective and respiratory equipment used or to be used</li> <li>- information from previous medical examinations of the affected individual that is not otherwise available to the examining physician.</li> </ul>
<b>AS.100.6.</b> Installations must obtain written opinions that meet specific requirements from examining physicians (29 CFR 1910.1001(l)(7)(i) and (l)(7)(ii)).	<p>Verify that the installation obtains a written signed opinion from the examining physician.</p> <p>Verify that the installation instructs the physician not to reveal in the written opinion any specific findings or diagnoses unrelated to occupational exposure to asbestos.</p> <p>Verify that this written opinion contains the results of the medical examination and includes:</p> <ul style="list-style-type: none"> <li>- the physician's opinion as to whether the individual has any detected medical conditions that would place him/her at an increased risk of material</li> </ul>

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<p><b>AS.100.7.</b> Installations must provide affected individuals with copies of the physician's written opinion (29 CFR 1910.1001(l)(7)(iii)).</p>	<p>health impairment from exposure to asbestos</p> <ul style="list-style-type: none"> <li>- any recommended limitations on the individual or upon the use of personal protective equipment such as clothing or respirators</li> <li>- a statement that the individual has been informed by the physician of the results of the medical examination and of any medical conditions resulting from asbestos exposure that require further explanation or treatment, and</li> <li>- a statement that the individual has been informed by the physician of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure.</li> </ul> <p>Verify that the installation provides a copy of the physician's written opinion to the affected individual within 30 days from its receipt.</p>



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<p><b>AS.110 RECORDKEEPING</b></p> <p><b>AS.110.1.</b> Installations must keep accurate records of all measurements taken to monitor personnel exposure to asbestos (29 CFR 1910.1001(m)(1)(i) through (m)(1)(iii)).</p> <p><b>AS.110.2.</b> Installations must keep specific records where the processing, use, or handling of products made from or containing asbestos is exempted from other requirements of 29 CFR 1910.1001 (29 CFR 1910.1001(m)(2)).</p> <p><b>AS.110.3.</b> Installations must establish and maintain records for personnel subject to medical surveillance (29 CFR</p>	<p>(NOTE: The installation may utilize the services of competent organizations such as industry trade associations and employee associations to maintain the records required by this checklist item.)</p> <p>Verify that the installation keeps an accurate record of all measurements taken to monitor personnel exposure to asbestos as prescribed in 29 CFR 1910.1001(d) (see checklist items AS.20.1 through AS.20.3).</p> <p>Verify that the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the date of measurement</li> <li>- the operation involving exposure to asbestos that is being monitored</li> <li>- sampling and analytical methods used and evidence of their accuracy</li> <li>- number, duration, and results of samples taken</li> <li>- type of respiratory protective devices worn, if any</li> <li>- name, social security number, and exposure of the personnel whose exposures are represented.</li> </ul> <p>Verify that the record is maintained for at least 30 yr.</p> <p>Determine whether the processing, use, or handling of products made from or containing asbestos is exempted from other requirements of this section under 29 CFR 1910.1001(d)(2)(iii) (see checklist item AS.20.1).</p> <p>Verify that the installation establishes and maintains an accurate record of objective data reasonably relied upon in support of the exemption.</p> <p>Verify that the record includes at least the following:</p> <ul style="list-style-type: none"> <li>- the product qualifying for exemption</li> <li>- the source of the objective data</li> <li>- the testing protocol, results of testing, and/or analysis of the material for the release of asbestos</li> <li>- a description of the operation exempted and how the data support the exemption</li> <li>- other data relevant to the operations, materials, processing, or personnel exposures covered by the exemption.</li> </ul> <p>Verify that the installation maintains this record for the duration of its reliance upon such objective data.</p> <p>Verify that the installation establishes and maintains an accurate record for each individual subject to medical surveillance under 29 CFR 1910.1001(l)(1)(i) (see checklist item AS.100.1).</p>

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<p>1910.1001(m)(3)).</p> <p><b>AS.110.4.</b> Training records must be maintained for a specified period (29 CFR 1910.1001(m)(4)).</p> <p><b>AS.110.5.</b> Installations must meet specific requirements with respect to the availability of the records they maintain (29 CFR 1910.1001(m)(5)).</p> <p><b>AS.110.6.</b> Transfer of records must meet specific requirements (29 CFR 1910.1001(m)(6)(i)).</p> <p><b>AS.110.7.</b> The installation must notify the Director at the expiration of the retention period for records (29 CFR 1910.1001(m)(6)(ii)).</p>	<p>Verify that the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the individual</li> <li>- the physician's written opinions</li> <li>- any personnel medical complaints related to exposure to asbestos</li> <li>- a copy of the information provided to the physician.</li> </ul> <p>Verify that the installation maintains this record for the duration of employment plus 30 yr.</p> <p>Verify that the installation maintains all personnel training records for 1 yr beyond the last date of employment of the given individual.</p> <p>Verify that the installation, upon written request, makes all records required to be maintained by 29 CFR 1910.1001 available to the Assistant Secretary and the Director for examination and copying.</p> <p>Verify that the installation, upon request, makes any exposure records required by 29 CFR 1910.1001(m)(1) (see checklist item AS.110.1) available for examination and copying to affected individuals, former personnel, designated representatives, and the Assistant Secretary.</p> <p>Verify that the installation, upon request, makes personnel medical records required by 29 CFR 1910.1001(m)(3) (see checklist item AS.110.3) available for examination and copying to the subject individual, to anyone having the specific written consent of the subject individual, and to the Assistant Secretary.</p> <p>Verify that, in the event of installation closure, all records required by this chapter are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p> <p>Verify that, at the expiration of the retention period for records required by this chapter, the installation notifies the Director at least 3 mo prior to the disposal of such records.</p> <p>Verify that the installation transmits these records to the Director, if requested to do so during the 3-mo period.</p>

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<p><b>AS.120</b>  <b>OBSERVATION OF MONITORING</b></p> <p><b>AS.120.1.</b> Installations must provide the opportunity to observe monitoring to certain parties (29 CFR 1910.1001(n)(1)).</p> <p><b>AS.120.2.</b> Observation procedures must meet specific requirements (29 CFR 1910.1001(n)(2)).</p>	<p>Verify that the installation provides affected personnel or their designated representatives an opportunity to observe any monitoring of personnel exposure to asbestos conducted in accordance with 29 CFR 1910.1001(d).</p> <p>Determine whether observation of the monitoring of personnel exposure to asbestos requires entry into areas where the use of protective clothing or equipment is required.</p> <p>Verify that the installation:</p> <ul style="list-style-type: none"> <li>- provides observers with protective clothing or equipment</li> <li>- ensures that the observers use the equipment</li> <li>- requires observers to meet all other applicable safety and health procedures.</li> </ul>



## Appendix 25-1

### Respiratory Protection for Asbestos Fibers (29 CFR 1910.1001, Table 1)

Airborne Concentration of Asbestos or Conditions of Use	Required Respirator Type
Not in excess of 1 f/cc (10 x OEL)	Half-mask air-purifying respirator, other than a disposable respirator, equipped with high-efficiency filters.
Not in excess of 5 f/cc (50 x OEL)	Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 10 f/cc (100 x OEL)	Any powered air-purifying respirator equipped with high-efficiency filters or any supplied-air respirator operated in continuous flow mode.
Not in excess of 100 f/cc (1000 x OEL)	Full facepiece supplied-air respirator operated in pressure demand mode.
Greater than 100 f/cc (1000 x OEL) or unknown concentration	Full facepiece supplied-air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus.

#### NOTE:

- Respirators assigned for higher environmental concentrations may be used at lower concentrations, or when required respirator use is independent of concentration.
- A high-efficiency filter is at least 99.97 percent efficient against mono-dispersed particles of 0.3  $\mu\text{m}$  in diameter or larger.



**Appendix 25-2**

**Frequency of Chest Roentgenogram**  
(29 CFR 1910.1001, Table 2)

Years since first exposure	Age of Employee		
	15 to 35	35+ to 45	45+
0 to 10	Every 5 yr	Every 5 yr	Every 5 yr
10+	Every 5 yr	Every 2 yr	Every 1 yr



## **CHAPTER 26**

### **LEAD**

## CHAPTER 26

### EOH: LEAD

### ECAMP-ANG

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#### Applicability

This chapter applies to all occupational exposure to lead, except in the construction industry or in agricultural operations covered by 29 CFR 1928.

#### Compliance Definitions

- *Action Level (AL)* - personnel exposure, without regard to the use of respirators, to an airborne concentration of lead per cubic meters of air of 30 mg/m<sup>3</sup>, averaged over an 8-h period (29 CFR 1910.1025(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1025(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1025(b)).
- *Filtering Face Piece Device* - a respirator that has a face piece made entirely of filtering or adsorbing material. These respirators do not have changeable filters or cartridges. The device does not have an inhalation valve, and it may or may not have an exhalation valve (AFOSH STD 48-1, Attachment 1, Section C).
- *Final Medical Determination* - the outcome of the multiple physician review mechanism or alternate medical determination mechanism used under provisions of this chapter (29 CFR 1910.1025(k) (1)(ii)(B)).
- *Lead* - metallic lead, all inorganic lead compounds, and organic lead soaps (all other organic lead compounds are excluded from this definition) (29 CFR 1910.1025(b)).
- *Medical Removal Protection Benefits* - the earnings, seniority, and other employment rights and benefits an individual would have without removal from lead exposure or imposition of limitations (29 CFR 1910.1025(k)(2)(ii)).
- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8-h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).
- *Personnel Exposure* - the exposure to airborne asbestos that would occur if an individual were not using respiratory protective equipment (29 CFR 1910.1025(d)(1)).



## EOH: LEAD

### GUIDANCE FOR CHECKLIST USERS

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Occupational Exposure Limits (OELs)	PB.10.1	26-5
Exposure Monitoring	PB.20.1 through PB.20.9	26-7
Methods of Compliance	PB.30.1 through PB.30.9	26-9
Respiratory Protection	PB.40.1 through PB.40.6	26-13
Protective Work Clothing and Equipment	PB.50.1 through PB.50.6	26-15
Housekeeping	PB.60.1 and PB.60.2	26-17
Hygiene Facilities and Practices	PB.70.1 through PB.70.8	26-19
Medical Surveillance	PB.80.1 through PB.80.9	26-21
Multiple Physician Review Mechanism	PB.90.1 through PB.90.8	26-25
Medical Removal	PB.100.1 through PB.100.6	26-29
Personnel Information and Training	PB.110.1 through PB.110.4	26-33
Signs	PB.120.1	26-35
Recordkeeping	PB.130.1 through PB.130.6	26-37
Observation of Monitoring	PB.140.1 and PB.140.2	26-41
Appendix 26-1, <i>Respiratory Protection for Lead Aerosols</i>		26-43



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<p><b>PB.10</b>  <b>OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>PB.10.1.</b> Installations must ensure that personnel are not exposed to excessive concentrations of lead (29 CFR 1910.1025(c)(i) and (c)(iii)).</p>	<p>(NOTE: AFOSH STD 48-8, <i>Controlling Exposures to Hazardous Substances</i>, requires the use of the most recent Threshold Limit Values published in <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (which is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.)</p> <p>Verify that installation personnel are not exposed to lead at airborne concentrations greater than 50 <math>\mu\text{g}/\text{m}^3</math> averaged over an 8-h period.</p> <p>(NOTE: When the installation uses respirators to supplement engineering and work practice controls and meets all the requirements of 29 CFR 1910.1025(f) (see the checklist items in PB.40), personnel exposure, for purposes of determining compliance with the OEL, may be considered to be at the level provided by the protection factor of the respirator for the periods during which the respirator is worn. These periods may be averaged with exposure levels during periods when respirators are not worn to determine the individual's daily TWA exposure.)</p>



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<p><b>PB.20 EXPOSURE MONITORING</b></p> <p><b>PB.20.1.</b> Installations must collect full shift personal samples (29 CFR 1910.1025(d)(1)(i) and (d)(1)(ii)).</p> <p><b>PB.20.2.</b> Installations must establish whether any personnel might be exposed to lead at or above the action level (29 CFR 1910.1025(d)(2)).</p> <p><b>PB.20.3.</b> Installations must monitor personnel exposures and make initial determinations (29 CFR 1910.1025(d)(3)).</p> <p><b>PB.20.4.</b> Installations must meet specific monitoring requirements when an initial determination indicates possible personnel exposure at or above the action level (29 CFR 1910.1025(d)(4)).</p> <p><b>PB.20.5.</b> Installations must keep records of any initial determination that indicates personnel exposure is below the action level (29 CFR 1910.1025(d)(5)).</p>	<p>Verify that the installation collects full shift (for at least 7 continuous hours) personal samples, including at least one sample for each shift for each job classification in each work area.</p> <p>Verify that such samples are representative of the monitored individual's regular daily exposure to lead.</p> <p>Verify that the installation establishes whether personnel might be exposed to lead at or above the action level.</p> <p>Verify that the installation monitors personnel exposure and bases its initial determinations on monitoring results and any of the following considerations:</p> <ul style="list-style-type: none"><li>- information, observations, or calculations that would indicate personnel exposure to lead</li><li>- previous measurements of airborne lead</li><li>- individual complaints of symptoms that might be attributable to lead exposure.</li></ul> <p>(NOTE: Monitoring for initial determination may be limited to a representative sample of the exposed personnel who the installation reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.)</p> <p>Determine whether an initial determination indicates the possibility of personnel exposure at or above the action level.</p> <p>Verify that the installation conducts monitoring that is representative of the exposure for each individual in the workplace who is exposed to lead.</p> <p>Determine whether an initial determination indicates that personnel exposure is below the action level.</p> <p>Verify that the installation makes a written record of such a determination.</p>

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<p><b>PB.20.6.</b> Monitoring must be repeated under specific circumstances (29 CFR 1910.1025(d)(6)(ii) and (d)(6)(iii)).</p>	<p>Verify that the record includes:</p> <ul style="list-style-type: none"> <li>- any information specified in 1910.1025(d)(3) (see checklist item PB.20.3)</li> <li>- date of determination</li> <li>- location within the installation</li> <li>- name and social security number of each individual monitored.</li> </ul> <p>Determine whether an initial determination or subsequent monitoring indicates that personnel exposure is at or above the action level, but below the OEL.</p> <p>Verify that the installation repeats monitoring every 6 mo until at least two consecutive measurements, taken at least 7 days apart, are below the action level.</p> <p>Determine whether initial monitoring indicates personnel exposure is above the OEL.</p> <p>Verify that the installation repeats monitoring quarterly until at least two consecutive measurements, taken at least 7 days apart, are below the OEL.</p> <p>Verify that, when two consecutive measurements are below the OEL but at or above the action level, the installation repeats monitoring every 6 mo until at least two consecutive measurements, taken at least 7 days apart, are below the action level.</p>
<p><b>PB.20.7.</b> Installations must conduct additional monitoring whenever conditions might result in new or additional exposures to lead (29 CFR 1910.1025(d)(7)).</p>	<p>Verify that the installation conducts additional monitoring of personnel exposure whenever a change in production, process, or personnel, or any other suspected changes, might result in new or additional exposure to lead.</p>
<p><b>PB.20.8.</b> Installations must notify personnel of monitoring results (29 CFR 1910.1025(d)(8)).</p>	<p>Verify that the installation notifies each individual in writing of the monitoring results that represent that individual's lead exposure.</p> <p>Verify that the installation notifies personnel within 5 working days of the receipt of monitoring results.</p> <p>Verify that, whenever results indicate that representative personnel exposure exceeds the OEL, the installation includes in its written notice a statement that the OEL was exceeded and a description of the corrective action to be taken to reduce exposure to or below the OEL.</p>
<p><b>PB.20.9.</b> Installations must use accurate monitoring and analysis methods (29 CFR 1910.1025(d)(9)).</p>	<p>Verify that the installation uses a method of monitoring and analysis with an accuracy (to a confidence level of 95 percent) of not less than plus or minus 20 percent for airborne concentrations of lead equal to or greater than 30 <math>\mu\text{g}/\text{m}^3</math>.</p>

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<p><b>PB.30</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>PB.30.1.</b> Installations must implement engineering and work practice controls to reduce personnel exposure to lead in specific circumstances (29 CFR 1910.1025 (e)(1)(i)).</p> <p><b>PB.30.2.</b> Installations must implement engineering controls to reduce personnel exposure to lead whenever any individual is exposed to lead above the OEL for 30 or fewer days per year (29 CFR 1910.1025(e)(1)(ii)).</p> <p><b>PB.30.3.</b> Installations must supplement engineering and work practice controls with respiratory protection when necessary to reduce personnel exposure below the OEL (29 CFR 1910.1025(e)(2)).</p> <p><b>PB.30.4.</b> Installations must establish and implement a written compliance program (29 CFR 1910.1025(e)(3)(i)).</p>	<p>Determine whether any individual is exposed to lead above the OEL for more than 30 days per year.</p> <p>Verify that the installation implements engineering and work practice controls (including administrative controls) to reduce and maintain personnel exposure.</p> <p>(NOTE: This requirement does not apply when the installation can demonstrate that such controls are not feasible.)</p> <p>Verify that, when engineering and work practice controls are not sufficient to reduce personnel exposure to or below the OEL, the installation supplements such controls with respiratory protection that meets the requirements of 29 CFR 1910.1025(f) (see the checklist items in PB.40).</p> <p>Determine whether any individual is exposed to lead above the OEL for 30 or fewer days per year.</p> <p>Verify that the installation implements engineering controls to reduce personnel exposure to 200 <math>\mu\text{g}/\text{m}^3</math>.</p> <p>Verify that, once personnel exposure has been reduced to 200 <math>\mu\text{g}/\text{m}^3</math>, the installation implements any combination of engineering, work practice (including administrative), and respiratory controls to reduce and maintain personnel exposure to lead to or below 50 <math>\mu\text{g}/\text{m}^3</math>.</p> <p>Determine whether the installation has been unable to reduce personnel exposure to below 50 <math>\mu\text{g}/\text{m}^3</math> with a combination of engineering and work practice controls.</p> <p>Verify that the installation supplements such controls with respiratory protection that meets the requirements of CFR 1910.1025(f) (see the checklist items in PB.40).</p> <p>Verify that the installation has a written compliance program to reduce lead exposures to or below the OEL and interim levels, if applicable, solely by means of engineering and work practice controls.</p>

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<p><b>PB.30.5.</b> Plans for the written compliance program must meet specific requirements (29 CFR 1910.1025(e)(3)(ii) and (e)(3)(iv)).</p>	<p>Verify that written plans for the compliance program include the following:</p> <ul style="list-style-type: none"> <li>- a description of each operation in which lead is emitted (i.e., machinery used, material processed, controls in place, crew size, individual job responsibilities, operating procedures, or maintenance practices)</li> <li>- a description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine selection of methods for controlling lead exposure</li> <li>- a report of the technology considered in meeting the OEL</li> <li>- air monitoring data that documents the source of lead emissions</li> <li>- a detailed schedule for implementation of the program, including such documentation as copies of purchase orders for equipment, construction contracts, etc.</li> <li>- a work practice program that includes items required under 29 CFR 1910.1025 (g) through 1910.1025(i) (see the checklist items in PB.50, PB.60, and PB.70)</li> <li>- an administrative control schedule required by 29 CFR 1910.1025(e)(5), if applicable (see checklist item PB.30.9)</li> <li>- any other relevant information.</li> </ul> <p>Verify that the installation revises and updates these plans at least every 6 mo to reflect the current status of the program.</p>
<p><b>PB.30.6.</b> Installations must make their written compliance plans readily available (29 CFR 1910.1025(e)(3)(iii)).</p>	<p>Verify that the installation submits its written plans, upon request, to the Assistant Secretary and the Director.</p> <p>Verify that the installation makes its written plans available (at the worksite) for examination and copying by:</p> <ul style="list-style-type: none"> <li>- the Assistant Secretary</li> <li>- the Director</li> <li>- any affected personnel</li> <li>- any authorized personnel representatives.</li> </ul>
<p><b>PB.30.7.</b> Installations using ventilation to control exposure must measure the effectiveness of the system (29 CFR 1910.1025(e)(4)(i)).</p>	<p>Determine whether the installation uses mechanical ventilation to control lead exposure.</p> <p>Verify that the installation makes measurements that demonstrate the effectiveness of the system in controlling exposure every 3 mo.</p> <p>(NOTE: The use of such measurements as capture velocity, duct velocity, or static pressure satisfies this requirement.)</p> <p>Verify that the installation makes such measurements within 5 days of any change in production, process, or control that might result in a change in personnel exposure to lead.</p>

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<p><b>PB.30.8.</b> Installations must take specific steps when air from exhaust ventilation is recirculated into the work-place (29 CFR 1910.1025(e)(4)(ii)).</p> <p><b>PB.30.9.</b> Installations using administrative controls to reduce personnel TWA lead exposure must establish and implement a job rotation schedule (29 CFR 1910.1025(e)(5)).</p>	<p>Determine whether air from exhaust ventilation is recirculated into the work-place.</p> <p>Verify that the ventilation system has a high efficiency filter with reliable backup filter.</p> <p>Verify that the installation installs, operates, and maintains controls that monitor the concentration of lead in the return air.</p> <p>Verify that the recirculation system is automatically bypassed if the ventilation system fails.</p> <p>Determine whether the installation uses administrative controls as a means of reducing personnel TWA exposure to lead.</p> <p>Verify that the installation has a job rotation schedule that includes:</p> <ul style="list-style-type: none"> <li>- name or identification number of each affected individual</li> <li>- duration and exposure levels at each job or work station where each affected individual is located</li> <li>- any other information useful for assessing the reliability of administrative controls in reducing personnel exposure to lead.</li> </ul>



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<p><b>PB.40 RESPIRATORY PROTECTION</b></p> <p><b>PB.40.1.</b> Installations must provide personnel with respirators and ensure their use when necessary (29 CFR 1910.1025(f)(1)).</p> <p><b>PB.40.2.</b> Installations must select appropriate approved respirators (29 CFR 1910.1025(f)(2)).</p> <p><b>PB.40.3.</b> Installations must ensure that respirators are fitted properly and exhibit minimum leakage (29 CFR 1910.1025(f)(3)(i) and (f)(3)(ii)).</p>	<p>Verify that, when respirator use is required, the installation provides respirators at no cost to its personnel.</p> <p>Verify that the installation ensures that personnel use respirators:</p> <ul style="list-style-type: none"><li>- during the time period necessary to install and implement engineering or work practice controls</li><li>- in work situations in which engineering and work practice controls are not sufficient to reduce exposures to or below the OEL</li><li>- whenever an individual requests a respirator.</li></ul> <p>Verify that, when respirator use is required, the installation selects the appropriate respirator or combination of respirators from those specified in Appendix 26-1.</p> <p>Verify that the installation provides personnel with a powered, air-purifying respirator in lieu of one from Appendix 26-1 whenever:</p> <ul style="list-style-type: none"><li>- an individual chooses to use this type of respirator</li><li>- this type of respirator will provide adequate protection to the individual.</li></ul> <p>Verify that the installation selects respirators from among those approved for protection against lead dust, fumes, and mist by MSHA and NIOSH.</p> <p>Verify that respirators issued to personnel exhibit minimum leakage.</p> <p>Verify that the installation uses fit tests to select facepieces that provide the protection required in Appendix 26-1.</p> <p>Verify that the installation performs either quantitative or qualitative face fit tests at the time of initial fitting and at least every 6 mo thereafter for personnel wearing negative pressure respirators.</p> <p>Verify that the installation uses the qualitative fit tests only for testing the fit of half-mask respirators where their use is permitted.</p> <p>Verify that the installation conducts qualitative fit tests in accordance with the specifications of Appendix D to 29 CFR 1910.1025.</p>

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<b>PB.40.4.</b> Installations must examine personnel who have difficulty breathing during respirator fit tests or use (29 CFR 1910.1025(f)(3)(iii)).	Verify that the installation examines personnel who have difficulty breathing during respirator use or fit tests as soon as possible to determine whether or not they can wear a respirator while performing the required duty.
<b>PB.40.5.</b> Installations must institute a respiratory protection program (29 CFR 1910.1025(f)(4) (i)).	Verify that the installation has a respiratory protection program that meets the requirements of 29 CFR 1910.134(b) and (d) through (f) (see checklist items PE.30.4, PE.30.5, PE.30.7, PE.30.9, PE.40.2, PE.60.1 through PE.60.3, PE.60.7, PE.70.1, PE.70.2, PE.70.4 through PE.70.7, PE.80.1, PE.90.2, PE.100.1 through PE.100.6, PE.100.9 through PE.100.12, PE.120.3).
<b>PB.40.6.</b> Installations must allow personnel to take necessary precautions with regard to respirator use (29 CFR 1910.1025 (f)(4)(ii) and (f)(4)(iii)).	Verify that the installation allows personnel who use filter respirators to replace the filter elements whenever they detect an increase in breathing resistance.  Verify that the installation keeps an adequate supply of filter elements for this purpose.  Verify that the installation allows personnel who wear respirators to leave work areas to wash their face and respirator facepiece whenever necessary to prevent skin irritation associated with respiratory use.

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<p><b>PB.50</b>  <b>PROTECTIVE CLOTHING AND EQUIPMENT</b></p> <p><b>PB.50.1.</b> Installations must provide personnel with protective clothing and equipment and ensure their use under specific circumstances (29 CFR 1910.1025(g)(1)).</p> <p><b>PB.50.2.</b> Installations must maintain protective clothing and equipment in a clean, dry, and effective condition (29 CFR 1910.1025(g)(2)(i) through (g)(2)(iii)).</p> <p><b>PB.50.3.</b> Protective clothing must be removed and kept in a secure location (29 CFR 1910.1025(g)(2) (iv) and (g)(2)(v)).</p> <p><b>PB.50.4.</b> Installations must inform any person who cleans or launders protective clothing or equipment of the potentially harmful effects of lead exposure (29 CFR 1910.1025(g)(2)(vi)).</p>	<p>Determine whether any installation personnel are exposed to lead above the OEL without regard to the use of respirators, or might suffer skin or eye irritation.</p> <p>Verify that the installation provides such personnel with protective work clothing and equipment such as, but not limited to, the following:</p> <ul style="list-style-type: none"> <li>- coveralls or similar full-body work clothing</li> <li>- gloves, hats, and shoes or disposable shoe coverlets</li> <li>- face shields, vented goggles</li> <li>- other appropriate equipment that meet the requirements 29 CFR 1910.133 (see the checklist items in PE.20).</li> </ul> <p>Verify that the installation provides required protective clothing in a clean and dry condition at least:</p> <ul style="list-style-type: none"> <li>- weekly</li> <li>- daily for personnel whose exposure levels without regard to respirator use are over 200 µg/m<sup>3</sup>.</li> </ul> <p>Verify that the installation provides for the cleaning, laundering, or disposal of required protective clothing and equipment.</p> <p>Verify that the installation repairs or replaces required protective clothing and equipment as needed to maintain their effectiveness.</p> <p>Verify that all protective clothing is removed at the completion of work shifts only in change rooms provided for that purpose.</p> <p>Verify that contaminated protective clothing that is to be cleaned, laundered, or disposed of is placed in a closed container in a change room.</p> <p>Verify that the installation notifies in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of lead exposure.</p>

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<b>PB.50.5.</b> Containers of contaminated protective clothing and equipment must be labeled (29 CFR 1910.1025 (g)(2)(vii)).	Verify that containers of contaminated protective clothing and equipment are labeled as follows:  <p style="text-align: center;"> <b>CAUTION: CLOTHING CONTAMINATED WITH LEAD.</b>  <b>DO NOT REMOVE DUST BY BLOWING OR SHAKING.</b>  <b>DISPOSE OF LEAD CONTAMINATED WASH WATER</b>  <b>IN ACCORDANCE WITH APPLICABLE LOCAL, STATE,</b>  <b>OR FEDERAL REGULATIONS.</b> </p>
<b>PB.50.6.</b> Installations must prohibit the removal of lead by means that disperses lead into the air (29 CFR 1910.1025(g)(2)(viii)).	Verify that the installation prohibits the removal of lead from protective clothing or equipment by blowing, shaking, or any other means that disperses lead into the air.

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<p><b>PB.60</b> <b>HOUSEKEEPING</b></p> <p><b>PB.60.1.</b> Installations must maintain all surfaces so that they are as free from lead as is practicable (29 CFR 1910.1025(h) (1)).</p> <p><b>PB.60.2.</b> Installations must follow specific guidelines when cleaning lead-contaminated floors (29 CFR 1910.1025(h) (2)).</p>	<p>Verify that all surfaces are maintained so that they are as free from lead as is practicable.</p> <p>Verify that the installation does not use compressed air to clean floors or other surfaces where lead accumulates.</p> <p>Verify that, when used, vacuums are used and emptied in a manner that minimizes the re-entry of lead into the workplace.</p> <p>(NOTE: The installation may use shoveling, dry or wet sweeping, and brushing on clean floors only when it has tried vacuuming or other equally effective methods and found them ineffective.)</p>



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<p><b>PB.70</b>  <b>HYGIENE FACILITIES AND PRACTICES</b></p> <p><b>PB.70.1.</b> Installations must prohibit specific activities in areas where personnel exposure exceeds the OEL (29 CFR 1910.1025(i)(1)).</p> <p><b>PB.70.2.</b> Installations must provide change rooms for personnel whose airborne lead exposure exceeds the OEL (29 CFR 1910.1025 (i)(2)).</p> <p><b>PB.70.3.</b> Installations must provide showers for personnel whose airborne lead exposure exceeds the OEL (29 CFR 1910.1025(i)(3)(i) and (i)(3)(ii)).</p> <p><b>PB.70.4.</b> Personnel who are required to shower must not leave the work-place wearing clothing or equipment worn during the work shift (29 CFR 1910.1025(i)(3)(iii)).</p> <p><b>PB.70.5.</b> Installations must provide lunchroom facilities for personnel whose airborne lead exposure exceeds the OEL (29 CFR 1910.1025 (i)(4)(i) and (i)(4) (ii)).</p>	<p>Verify that, in areas where personnel exposure exceeds the OEL without regard to respirator use:</p> <ul style="list-style-type: none"> <li>- food or beverage is not present or consumed</li> <li>- tobacco products are not present or consumed</li> <li>- cosmetics are not applied.</li> </ul> <p>Verify that such activities are restricted to change rooms, lunch rooms, and showers required by 29 CFR 1910.1025(i)(2) through 1910.1025(i)(4) (see checklist items PB.70.2 through PB.70.7).</p> <p>Verify that the installation provides clean change rooms for personnel who work in areas where their airborne exposure to lead exceeds the OEL, without regard to respirator use.</p> <p>Verify that change rooms are equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross-contamination.</p> <p>Verify that the installation provides showers for personnel who work in areas where their airborne exposure to lead exceeds the OEL, without regard to respirator use.</p> <p>Verify that such personnel shower at the end of every work shift.</p> <p>Verify that personnel who are required to shower under 29 CFR 1910.1025(i)(3)(i) (see checklist item PB.70.3) do not leave the workplace with any clothing or equipment worn during the work shift.</p> <p>Verify that the installation provides lunchroom facilities for personnel who work in areas where their airborne exposure to lead exceeds the OEL, without regard to respirator use.</p> <p>Verify that such facilities have a temperature-controlled, positive-pressure, filtered air supply and are readily accessible to personnel.</p>

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<b>PB.70.6.</b> Personnel must not enter lunchroom facilities with protective work clothing or equipment (29 CFR 1910.1025(i)(4) (iv)).	<p>Verify that personnel do not enter lunchroom facilities with protective work clothing or equipment.</p> <p>(NOTE: This requirement does not apply if surface lead dust has been removed by vacuuming, downdraft booth, or another cleaning method.)</p>
<b>PB.70.7.</b> Personnel whose airborne lead exposure exceeds the OEL must wash hands and face before eating, drinking, or smoking (29 CFR 1910.1025(i)(4)(iii)).	<p>Verify that personnel who work in areas where their airborne exposure to lead exceeds the OEL wash their hands and face before eating, drinking, or smoking.</p>
<b>PB.70.8.</b> Installations must provide an adequate number of lavatories (29 CFR 1910.1025(i)(5). (d)(1), and (d)(2)).	<p>Verify that the installation provides an adequate number of lavatories.</p> <p>Verify that the lavatories are maintained in a sanitary condition.</p> <p>Verify that the installation provides each lavatory with:</p> <ul style="list-style-type: none"> <li>- hot and cold running water, or tepid running water</li> <li>- hand soap or similar cleansing agents.</li> </ul> <p>Verify that the installation supplies any of the following in a location convenient to lavatories:</p> <ul style="list-style-type: none"> <li>- individual hand towels, or sections thereof, of cloth or paper</li> <li>- warm air blowers</li> <li>- clean individual sections of continuous clothing toweling.</li> </ul>

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<p><b>PB.80</b>  <b>MEDICAL SURVEILLANCE</b></p> <p><b>PB.80.1.</b> Installations must institute a medical surveillance program for personnel exposed to lead above the action level for more than 30 days per year (29 CFR 1910.1025(j)(1)(i) through (j)(1)(iii)).</p> <p><b>PB.80.2.</b> Installations must make biological monitoring available to personnel exposed to lead above the action level for more than 30 days per year (29 CFR 1910.1025(j)(2)(i)).</p> <p><b>PB.80.3.</b> Installations must provide a follow-up blood sampling test to personnel (29 CFR 1910.1025(j)(2)(ii)).</p> <p><b>PB.80.4.</b> Blood lead level sampling and analysis must meet standards for accuracy (29 CFR 1910.1025(j)(2)(iii)).</p>	<p>Determine whether any personnel are exposed to lead above the action level for more than 30 days per year.</p> <p>Verify that the installation institutes a medical surveillance program for such personnel.</p> <p>Verify that medical examinations and procedures performed as part of the medical surveillance program are performed or supervised by a licensed physician.</p> <p>Verify that the installation provides medical surveillance, including multiple physician review, without cost to personnel and at a reasonable time and place.</p> <p>Verify that the installation makes biological monitoring, in the form of blood sampling and analysis for lead and zinc protoporphyrin levels, available to such personnel on the following schedule:</p> <ul style="list-style-type: none"> <li>- at least every 6 mo to each individual covered under 29 CFR 1910.1025(j)(1)(i) (see checklist item PB.80.1)</li> <li>- at least every 2 mo for each individual whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/100 g of whole blood until two consecutive blood samples and analyses indicate a blood lead level below 40 µg/100 g of whole blood</li> <li>- at least monthly during the removal period of each individual removed from exposure to lead due to an elevated blood lead level.</li> </ul> <p>Verify that, whenever the results of a blood lead level test indicate that an individual's blood lead level exceeds the numerical criterion for medical removal, the installation provides a second (follow-up) blood sampling test within 2 wk of receiving the results of the first blood sampling test.</p> <p>(NOTE: The numerical criterion for medical removal is specified under 29 CFR 1910.1025(k)(1)(i)(A) (see checklist item PB.100.1).)</p> <p>Verify that blood lead level sampling and analysis have an accuracy (to a confidence level of 95 percent) within plus or minus 15 percent or 6 µg/100 mL, whichever is greater.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>PB.80.5.</b> Installations must notify personnel whose blood lead level exceeds 40 µg/100 g (29 CFR 1910.1025(j)(2)(iv)).</p> <p><b>PB.80.6.</b> Installations must make medical examinations and consultations available to personnel exposed to lead above the action level for more than 30 days per year (29 CFR 1910.1025(j)(3)(i)).</p> <p><b>PB.80.7.</b> Medical examinations must include specific elements (29 CFR 1910.1025(j)(3)(ii)).</p>	<p>Verify that blood lead level sampling and analysis are conducted by a laboratory that is either licensed by the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services or has received a satisfactory grade in blood lead proficiency testing from the CDC in the previous 12 mo.</p> <p>Verify that, within 5 working days of the receipt of biological monitoring results, the installation notifies, in writing, each individual whose blood lead level exceeds µg/ 100 g of the following:</p> <ul style="list-style-type: none"> <li>- the individual's blood lead level</li> <li>- that 29 CFR 1910.1025 requires temporary medical removal with Medical Removal Protection benefits when an individual's blood lead level exceeds the numerical criterion for medical removal under 29 CFR 1910.1025(k)(1)(i) (see checklist item PB.100.1).</li> </ul> <p>Verify that the installation makes medical examinations and consultation available to such personnel according to the following schedule:</p> <ul style="list-style-type: none"> <li>- at least annually for each individual for whom a blood sampling test conducted at any time during the preceding 12 mo indicated a blood lead level at or above 40 µg/100 g</li> <li>- prior to assignment for each individual being assigned for the first time to an area in which airborne concentrations of lead are at or above the action level</li> <li>- as soon as possible upon notification by an individual that he or she: <ul style="list-style-type: none"> <li>- has developed signs or symptoms commonly associated with lead intoxication</li> <li>- desires medical advice concerning the effects of current or past exposure to lead on his/her ability to procreate a healthy child</li> <li>- has demonstrated difficulty in breathing during a respirator fitting test or use</li> </ul> </li> <li>- as medically appropriate for each individual who is: <ul style="list-style-type: none"> <li>- removed from exposure to lead due to a risk of sustaining material impairment to health</li> <li>- otherwise limited pursuant to a final medical determination.</li> </ul> </li> </ul> <p>Verify that required medical examinations include the following:</p> <ul style="list-style-type: none"> <li>- a detailed work history and medical history, with particular attention to: <ul style="list-style-type: none"> <li>- past lead exposure (occupational and nonoccupational)</li> <li>- personal habits (smoking, hygiene, etc.)</li> <li>- past gastrointestinal, hematologic, renal, cardiovascular, reproductive, and neurological problems</li> </ul> </li> <li>- a thorough physical examination, with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems</li> <li>- an evaluation of pulmonary status if respiratory protection will be used</li> </ul>

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<p><b>PB.80.8.</b> Prophylactic chelation of installation personnel is prohibited (29 CFR 1910.1025(j)(4)).</p> <p><b>PB.80.9.</b> Therapeutic or diagnostic chelation of installation personnel must be performed under the supervision of a licensed physician (29 CFR 1910.1025(j)(4)(ii)).</p>	<ul style="list-style-type: none"><li>- a blood pressure measurement</li><li>- a blood sample and analysis that determines:<ul style="list-style-type: none"><li>- blood lead level</li><li>- hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology</li><li>- zinc protoporphyrin</li><li>- blood urea nitrogen</li><li>- serum creatinine</li></ul></li><li>- a routine urinalysis with microscopic examination</li><li>- any laboratory or other test that the examining physician deems necessary by sound medical practice.</li></ul> <p>Verify that the content of medical examinations is determined by an examining physician and, if requested by an individual, includes pregnancy testing or laboratory evaluation of male fertility.</p> <p>Verify that the installation ensures that no person it retains, employs, supervises, or controls engages in prophylactic chelation of personnel at any time.</p> <p>Verify that therapeutic or diagnostic chelation of installation personnel is performed under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring.</p> <p>Verify that the installation provides the affected individual with written notification prior to the procedure.</p>



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<p><b>PB.90</b>  <b>MULTIPLE PHYSICIAN REVIEW MECHANISM</b></p> <p><b>PB.90.1.</b> Installations must allow individuals to designate a second physician following an initial medical examination or consultation (29 CFR 1910.1025(j)(3) (iii)(A)).</p> <p><b>PB.90.2.</b> Installations must promptly notify personnel of their right to seek a second medical opinion (29 CFR 1910.1025(j)(3) (iii)(B)).</p> <p><b>PB.90.3.</b> Installations and personnel must make efforts to resolve disagreements that arise between an initial and second physician (29 CFR 1910.1025(j)(3)(iii) (C)).</p>	<p>(NOTE: The installation and an authorized personnel representative may agree upon the use of any expeditious alternate physician determination mechanism in lieu of the multiple physician review mechanism outlined here as long as the alternate mechanism otherwise satisfies the requirements of 29 CFR 1910.1025(j).)</p> <p>Verify that, if the installation selected the initial physician to conduct any medical examination or consultation provided to an individual, the installation allows the individual to designate a second physician:</p> <ul style="list-style-type: none"> <li>- to review any findings, determinations, or recommendations of the initial physician</li> <li>- to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.</li> </ul> <p>Verify that the installation notifies each individual of his/her right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation as provided under this section.</p> <p>(NOTE: The installation may condition its participation in, and payment for, the multiple physician review mechanism upon the individual doing both of the following within 15 days after receipt of the foregoing notification, or of the initial physician's written opinion, whichever is later:</p> <ul style="list-style-type: none"> <li>- informing the installation that he or she intends to seek a second medical opinion</li> <li>- initiating steps to make an appointment with a second physician.)</li> </ul> <p>Verify that the installation and individual in question make efforts to resolve any disagreement between the two physicians.</p> <p>Verify that, if the two physicians in question are unable to resolve their disagreement, the installation and individual, through their respective physicians, designate a third physician to:</p> <ul style="list-style-type: none"> <li>- review any findings, determinations, or recommendations of the prior physicians</li> <li>- conduct such examinations, consultations, laboratory tests, and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement.</li> </ul>

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<p><b>PB.90.4.</b> Installations must act in a fashion consistent with the findings, determinations, and recommendations of a third physician (29 CFR 1910.1025(j)(3)(iii)(C)).</p>	<p>Verify that the installation acts in a fashion consistent with the findings, determinations, and recommendations of a third physician.</p> <p>(NOTE: This requirement does not apply if the installation and individual reach an agreement that is otherwise consistent with the recommendations of at least one of the three physicians.)</p>
<p><b>PB.90.5.</b> Installations must provide specific information to any physician conducting medical examinations or consultations required by this section (29 CFR 1910.1025(j)(3)(iv)).</p>	<p>Verify that the installation provides an initial physician with the following information:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1025 and all appendices</li> <li>- a description of the affected individual's duties as they relate to his/her exposure</li> <li>- the individual's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable)</li> <li>- a description of any personal protective equipment used or to be used</li> <li>- prior blood lead determinations</li> <li>- all prior written medical opinions in the installation's possession or control concerning the affected individual.</li> </ul> <p>Verify that the installation provides the foregoing information to any designated second or third physicians upon their or the affected individual's request.</p>
<p><b>PB.90.6.</b> Installations must obtain, and provide the affected individual with, a copy of the written medical opinion from each examining or consulting physician (29 CFR 1910.1025(j)(3)(v) (A)).</p>	<p>Verify that the installation provides any affected individual with a copy of the written medical opinion from each examining or consulting physician.</p>
<p><b>PB.90.7.</b> Written medical opinions must contain specific information (29 CFR 1910.1025(j)(3)(v) (A)).</p>	<p>Verify that the written medical opinion includes the following information:</p> <ul style="list-style-type: none"> <li>- the physician's opinion as to whether the individual has any detected medical condition that would place him or her at increased risk of material impairment to health from exposure to lead</li> <li>- any recommended special protective measures to be provided to the individual or limitations to be placed upon the individual's exposure to lead</li> <li>- any recommended limitation upon the individual's use of respirators, including a determination of whether he or she can wear a powered air purifying respirator if the physician determines that he or she cannot wear a negative pressure respirator</li> <li>- the results of the blood lead determinations.</li> </ul>

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<b>PB.90.8.</b> Installations must issue specific instructions to each examining or consulting physician (29 CFR 1910.1025(j)(3)(v)(B)).	Verify that the installation instructs each examining or consulting physician to: <ul style="list-style-type: none"><li>- not reveal either in the written opinion or by any other means of communication with the installation any findings, including laboratory results, or diagnoses unrelated to an individual's occupational exposure to lead</li><li>- advise the individual of any medical condition, occupational or nonoccupational, that dictates further medical examination or treatment.</li></ul>



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<b>PB.100 MEDICAL REMOVAL</b>	
<b>PB.100.1.</b> Certain personnel must be removed from work (29 CFR 1910.1025(k)(1)).	<p>Verify that, for personnel with exposure levels at or above the action level, the installation removes an employee from work on each occasion that a periodic and a follow-up blood sampling test conducted in accordance with the requirements of 29 CFR 1910.1025 indicates that the blood lead level is at or above 60 µg/100 g of whole blood.</p> <p>Verify that, for personnel with exposure levels at or above the action level, the installation removes an employee from work on each occasion that the average of the last three blood sampling testes conducted in accordance with the requirements of 29 CFR 1910.1025 (or the average of all blood sampling test conducted over the previous 6 mo, whichever is longer) indicates that the blood lead level is at or above 50 µg/100 g of whole blood.</p> <p>(NOTE: This requirement does not apply to personnel whose last blood sampling test indicated a blood lead level at or below 40 µg/100 g of whole blood.)</p> <p>Determine whether, for personnel with exposure levels at or above the action level, a final medical determination results in a finding, determination, or opinion that the employee has a detected medical condition that places the employee at increased risk of material impairment to health from exposure to lead.</p> <p>Verify that the installation removes such personnel from work.</p> <p>Verify that, if the final medical determination recommends special protective measures for such personnel, or limitations on their exposure to lead, the installation implements and acts in a fashion consistent with the recommendations.</p>
<b>PB.100.2.</b> Installations must return personnel to their former job status provided specific conditions are met (29 CFR 1910.1025(k)(1) (iii)).	<p>Verify that the installation returns personnel to their former job status under the following conditions:</p> <ul style="list-style-type: none"> <li>- for an individual removed due to a blood lead level at or above 80 µg/100 g, when two consecutive blood sampling tests indicate that his/her blood lead level is at or below 60 µg/100 g of whole blood</li> <li>- for an individual removed due to a blood lead level at or above 70 µg/100 g, when two consecutive blood sampling tests indicate that his/her blood lead level is at or below 50 g/100 g of whole blood</li> <li>- for an individual removed due to a blood lead level at or above 60 µg/100 g, or due to an average blood lead level at or above 50 µg/100 g, when two consecutive blood sampling tests indicate that his/her blood lead level is at or below 40 µg/100 g of whole blood</li> </ul>

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<p><b>PB.100.3.</b> Installations must remove limitations on personnel or end protective measures under specific circumstances (29 CFR 1910.1025(k)(1)(iv)).</p> <p><b>PB.100.4.</b> Installations must not return an individual to work under specific circumstances pending a final medical determination (29 CFR 1910.1025(k)(1)(v)).</p>	<ul style="list-style-type: none"> <li>- for an individual removed due to a final medical determination, when a subsequent final medical determination results in a medical finding, determination, or opinion that the individual no longer has a detected medical condition that places him or her at increased risk of material impairment to health from exposure to lead.</li> </ul> <p>(NOTE: The requirement that the installation return an individual to his/her former job status is not intended to expand upon or restrict any rights an individual has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.)</p> <p>Determine whether a medical determination indicates that limitations and/or protective measures recommended for an individual by a final medical determination are no longer necessary.</p> <p>Verify that the installation terminates such limitations and protective measures for the affected individual.</p> <p>Determine whether the multiple physician review or alternate medical determination mechanism has not yet resulted in a final medical determination.</p> <p>Verify that the installation does not return the affected individual to his/her former job status, end any special protective measures provided that individual, or remove any limitations placed upon the individual if either:</p> <ul style="list-style-type: none"> <li>- the initial removal, special protection, or limitation of the individual resulted from a final medical determination that differed from the findings, determinations, or recommendations of the initial physician</li> <li>- the individual has been on removal status for the preceding 18 mo due to an elevated blood lead level.</li> </ul> <p>(NOTE: The installation may otherwise return an affected individual to his/her former job status, end special protective measures provided that individual, or remove limitations placed upon the individual consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the individual's health status.)</p> <p>(NOTE: The installation may take any of the following actions pending a final medical determination:</p> <ul style="list-style-type: none"> <li>- remove the individual from exposure to lead</li> <li>- provide special protective measures to the individual</li> <li>- place limitations upon the individual consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the individual's health status.)</li> </ul>

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<p><b>PB.100.5.</b> Installations must provide medical protection benefits to personnel removed from lead exposure or otherwise limited (29 CFR 1910.1025(k)(2)(i), (k) (2) (iii), and (k)(2)(vii)).</p>	<p>Determine whether any individual has been removed from exposure to lead or otherwise limited according to the provisions of this section.</p> <p>Verify that the installation provides the individual up to 18 mo of medical removal protection benefits on each occasion that he or she is so removed or limited.</p> <p>(NOTE: Under this requirement, medical removal protection benefits are the earnings, seniority, and other employment rights and benefits an individual would have without removal from lead exposure or the imposition of benefits.)</p> <p>(NOTE: The requirement to provide medical removal protection benefits applies as well to installations that voluntarily remove from exposure or otherwise limit an individual due to the effects of lead exposure on that individual's medical condition.)</p> <p>(NOTE: During the period of time an individual is removed from normal exposure or otherwise limited, the installation may condition the provision of medical removal benefits upon the individual's participation in follow-up medical surveillance.)</p> <p>Verify that, if a removed individual files a claim for workers' compensation payments for a lead-related disability, the installation continues to provide medical removal protection benefits.</p> <p>(NOTE: To the extent that an award is made to the individual for earnings lost during the period of removal, the installation's medical removal protection obligation will be reduced by such amount. The installation will receive no credit for workers' compensation payments received by the individual for treatment-related expenses.)</p> <p>(NOTE: The installation's obligation to provide medical removal protection benefits to a removed individual will be reduced to the extent that the individual receives compensation for earnings lost during the period of removal either from a publicly or installation-funded compensation program or receives income from employment with another employer made possible by virtue of his/her removal.)</p>
<p><b>PB.100.6.</b> Installations must take specific steps with regard to personnel whose blood lead level does not decline within 18 mo of removal (29 CFR 1910.1025 (k)(2)(vi)).</p>	<p>Verify that the installation takes the following steps with regard to such individuals:</p> <ul style="list-style-type: none"> <li>- makes available a medical examination pursuant to this section to obtain a final medical determination with respect to the individual</li> <li>- assures that the final medical determination indicates whether or not the individual may be returned to his/her former job status and, if not, determines what steps to take to protect the individual's health.</li> </ul>

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	<p>Verify that, where the final medical determination has not yet been obtained, or once obtained indicates that the individual may not yet be returned to his/her former job status, the installation continues to provide medical removal protection benefits to the individual until either:</p> <ul style="list-style-type: none"> <li>- the individual is returned to former job status</li> <li>- a final medical determination is made that the individual is incapable of ever safely returning to his/her former job status.</li> </ul> <p>Verify that, when the installation acts pursuant to a final medical determination that allows the return of the individual to his/her former job status despite what would otherwise be an unacceptable blood lead level, later questions concerning re-removal of the individual are decided by a final medical determination.</p> <p>(NOTE: The installation need not automatically remove such an individual pursuant to the blood lead level removal criteria provided by this section.)</p>

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<p><b>PB.110 PERSONNEL INFORMATION AND TRAINING</b></p> <p><b>PB.110.1.</b> Installations where personnel may be exposed to airborne lead at any level must provide personnel with specific information (29 CFR 1910.1025(l)(1)(i)).</p> <p><b>PB.110.2.</b> Installations must institute a training program for all personnel who are exposed to lead at or above the action level (29 CFR 1910.1025 (l)(1)(ii) through (l)(1)(iv)).</p> <p><b>PB.110.3.</b> Installations must provide specific information to personnel as part of the training program (29 CFR 1910.1025(l)(1)(v)).</p>	<p>Verify that the installation provides personnel with the information contained in Appendices A and B to 29 CFR 1910.1025.</p> <p>Verify that the installation has a personnel training program.</p> <p>Verify that the installation ensures the participation of any personnel for whom the possibility of skin or eye irritation exists.</p> <p>Verify that the installation provides training:</p> <ul style="list-style-type: none"> <li>- prior to the time of initial job assignment</li> <li>- annually for all affected personnel.</li> </ul> <p>Verify that the installation includes the following information in its training program:</p> <ul style="list-style-type: none"> <li>- the content of 29 CFR 1910.1025 and all appendices</li> <li>- the specific nature of operations that might result in exposure to lead above the action level</li> <li>- the purpose, proper selection, fitting, use, and limitations of respirators</li> <li>- the purpose and a description of the medical surveillance and medical removal protection programs, including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females)</li> <li>- the engineering controls and work practices associated with an individual's job assignment</li> <li>- the contents of any compliance plan in effect</li> <li>- instructions that chelating agents: <ul style="list-style-type: none"> <li>- should not be used routinely to remove lead from the body</li> <li>- should not be used at all except under the direction of a licensed physician.</li> </ul> </li> </ul>

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<b>PB.110.4.</b> Installations must make information and training materials readily available to personnel (29 CFR 1910.1025(1)(2)(i) through (1)(2)(iii)).	<p>Verify that the installation makes readily available to all affected personnel a copy of 29 CFR 1910.1025 and all appendices.</p> <p>Verify that, if requested, the installation provides all materials relating to the personnel information and training program to the Assistant Secretary and the Director.</p> <p>Verify that the installation distributes to personnel any materials pertaining to the <i>OSH Act</i> and the regulations pursuant to the Act that are provided to the installation by the Assistant Secretary.</p>

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<p><b>PB.120</b> <b>SIGNS</b></p> <p><b>PB.120.1.</b> Installations must post warning signs in work areas where the OEL is exceeded (29 CFR 1910.1025 (m)).</p>	<p>Verify that the installation posts the following warning sign in each work area where the OEL is exceeded:</p> <p style="text-align: center;">WARNING LEAD WORK AREA POISON NO SMOKING OR EATING.</p> <p>Verify that each sign is illuminated and cleaned as necessary so that the legend is readily visible.</p> <p>Verify that no statement appears on or near such signs that contradicts or detracts from their meaning.</p> <p>(NOTE: The installation may otherwise use signs required by other statutes, regulations, or ordinances in addition to or in combination with these signs.)</p>



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<p><b>PB.130</b> <b>RECORDKEEPING</b></p> <p><b>PB.130.1.</b> Installations must establish and maintain accurate records of all exposure monitoring (29 CFR 1910.1025(n)(1)).</p> <p><b>PB.130.2.</b> Installations must establish and maintain accurate records of all medical monitoring (29 CFR 1910.1025(n) (2)).</p>	<p>Verify that the installation establishes and maintains accurate records of all exposure monitoring required by 29 CFR 1910.1025(d) (see the checklist items in PB.20).</p> <p>Verify that these records include:</p> <ul style="list-style-type: none"><li>- the date(s), number, duration, location, and results of each of the samples taken, including a description of the sampling procedure used to determine representative personnel exposure (where applicable)</li><li>- a description of the sampling and analytical methods used and evidence of their accuracy</li><li>- the type of respiratory protective devices worn (if any)</li><li>- name, social security number, and job classification of any individual monitored and of all other personnel whose exposure the measurement is intended to represent</li><li>- environmental variables that might affect the measurement of personnel exposure.</li></ul> <p>Verify that the installation maintains these records for at least 40 yr or for the duration of an individual's employment plus 20 yr, whichever is longer.</p> <p>Verify that the installation establishes and maintains an accurate record for each individual subjected to the medical monitoring required by 29 CFR 1910.1025(j) (see the checklist items in PB.80).</p> <p>Verify that each record includes:</p> <ul style="list-style-type: none"><li>- the name, social security number, and description of the individual's duties</li><li>- a copy of the physician's written opinions</li><li>- results of any airborne exposure monitoring done for the individual and the representative exposure levels supplied to the physician</li><li>- any of the individual's medical complaints related to lead exposure.</li></ul> <p>Verify that the installation keeps, or assures that the examining physician keeps, the following medical records:</p> <ul style="list-style-type: none"><li>- a copy of the medical examination results, including medical and work history</li><li>- a description of the laboratory procedures and a copy of any standards or guide-lines used to interpret the test results or references to that information</li><li>- a copy of the results of biological monitoring.</li></ul>

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<p><b>PB.130.3.</b> Installations must establish and maintain accurate records for personnel removed from exposure to lead (29 CFR 1910.1025 (n)(3)).</p>	<p>Verify that the installation maintains, or assures that the physician maintains, such medical records for at least 40 yr or the duration of employment plus 20 yr, whichever is longer.</p> <p>Verify that the installation establishes and maintains an accurate record for each individual removed from current exposure to lead as required by 29 CFR 1910.1025(k) (see checklist item PB.100.1).</p> <p>Verify that each record includes:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the individual</li> <li>- the date of each occasion that the individual was removed from current exposure to lead as well as the corresponding date on which the individual was returned to his/her former job status</li> <li>- a brief explanation of how each removal was or is being accomplished</li> <li>- a statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.</li> </ul> <p>Verify that the installation maintains each medical removal record for at least the duration of an individual's employment.</p>
<p><b>PB.130.4.</b> Installations must make available all environmental monitoring, medical monitoring, and medical removal records (29 CFR 1910.1025(n)(4)).</p>	<p>Verify that, upon request, the installation provides all required records to the Assistant Secretary and the Director for examining and copying.</p> <p>Verify that, upon request, the installation provides all required records to personnel, designated representatives, and the Assistant Secretary and Director, in accordance with 29 CFR 1910.1020(a) through 1910.1020(e) and (2)-(i)).</p>
<p><b>PB.130.5.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.1025(n)(5)(i), (n)(5)(ii), and (n)(5)(iv)).</p>	<p>Verify that, in the event of personnel reassignment, all monitoring and medical removal records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that casefiles be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>

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<b>PB.130.6.</b> The installation must notify the Director at the expiration of the retention period for records (29 CFR 1910.1025(n)(5)(iii)).	Verify that, at the expiration of the retention period for records required by this section, the installation notifies the Director at least 3 mo prior to the disposal of such records.  Verify that the installation transmits these records to the Director, if requested to do so during the 3-mo period.



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<p><b>PB.140</b>  <b>OBSERVATION OF MONITORING</b></p> <p><b>PB.140.1.</b> Installations must allow affected personnel or their designated representatives an opportunity to observe monitoring of personnel exposure (29 CFR 1910.1025 (o)(1)).</p> <p><b>PB.140.2.</b> Observers of personnel exposure monitoring must be adequately protected and follow specific procedures (29 CFR 1910.1025 (o)(1)(i)).</p>	<p>Verify that the installation provides affected personnel or their designated representatives with an opportunity to observe any monitoring of personnel exposure to lead conducted under the provisions of 29 CFR 1910.1025(d).</p> <p>(NOTE: Without interfering with the monitoring, observers may:</p> <ul style="list-style-type: none"> <li>- receive an explanation of the measurement procedures</li> <li>- observe all steps related to the monitoring of lead performed at the place of exposure</li> <li>- record the results obtained or receive copies of the results when returned by the laboratory.)</li> </ul> <p>Verify that, when observation of the monitoring of personnel exposure requires entry into an area where the use of respirators, protective clothing, or equipment is required, the installation:</p> <ul style="list-style-type: none"> <li>- provides the observers with, and assures their use of, such respirators, clothing, and equipment</li> <li>- ensures that the observers comply with all applicable safety and health procedures.</li> </ul>



## Appendix 26-1

### Respiratory Protection for Lead Aerosols (29 CFR 1910.1025, Table II)

Airborne Concentration of Lead or Condition of Use	Required Respirator <sup>(1)</sup>
Not in excess of 0.5 mg/m <sup>3</sup> (10X OEL)	Half-mask, air-purifying respirator equipped with high efficiency filters. <sup>(2)(3)</sup>
Not in excess of 2.5 mg/m <sup>3</sup> (50X OEL)	Full facepiece, air-purifying respirator with high efficiency filters. <sup>(3)</sup>
Not in excess of 50 mg/m <sup>3</sup> (1000X OEL)	1. Any powered, air-purifying respirator with high efficiency filters, <sup>(3)</sup> or 2. Half-mask supplied-air respirator operated in positive-pressure mode. <sup>(2)</sup>
Not in excess of 100 mg/m <sup>3</sup> (2000X OEL)	Supplied-air respirators with full facepiece, hood, helmet, or suit, operated in positive-pressure mode.
Greater than 100 mg/m <sup>3</sup> , unknown concentration of fire fighting	Full facepiece, self-contained breathing apparatus operated in positive-pressure mode.

<sup>(1)</sup> Respirators specified for high concentrations can be used at lower concentrations of lead.

<sup>(2)</sup> A full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

<sup>(3)</sup> A high efficiency particulate filter is 99.97 percent efficient against 0.3 micron sized particles.



## **CHAPTER 27**

### **CADMIUM**

## CHAPTER 27

### EOH: CADMIUM

#### ECAMP-ANG

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#### Compliance Definitions

- *Action Level (AL)* - an airborne concentration of cadmium of  $2.5 \mu\text{g}/\text{m}^3$ , calculated as an 8-h TWA (29 CFR 1910.1027(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1027(b)).
- *Authorized Person* - any person authorized by the installation and required by work duties to be present in regulated areas or any person authorized by the *Occupational Safety and Health Act* or regulations issued under it to be in regulated areas (29 CFR 1910.1027(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1027(b)).
- *Filtering Face Piece Device* - a respirator that has a face piece made entirely of filtering or adsorbing material. These respirators do not have changeable filters or cartridges. The device does not have an inhalation valve, and it may or may not have an exhalation valve (AFOSH STD 48-1, Attachment 1, Section C).
- *Final Medical Determination* - with respect to cadmium, the written medical opinion of the individual's health status by the examining physician, or if multiple physician review or the alternative physician determination is invoked, it is the final, written medical finding, recommendation, or determination that emerges from that process (29 CFR 1910.1027(b)).
- *High-Efficiency Particulate Air (HEPA) Filter* - a filter capable of trapping and retaining at least 99.97 percent of  $0.3 \mu\text{m}$  diameter monodispersed particles (29 CFR 1910.1027(b)).
- *Objective Data* - with respect to cadmium, information demonstrating that a particular product or material containing cadmium or a specific process, operation, or activity involving cadmium cannot release dust or fumes in concentrations at or above the action level even under the worst-case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of cadmium-containing products or materials. The data from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the installation's current operations (29 CFR 1910.1027(b)).
- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8-h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).

- *Qualitative Fit-Test* - a pass/fail fit-test that relies on the subject's sensory response to detect the challenge agent (AFOSH STD 48-1, Attachment 1, Section C).
- *Quantitative Fit-Test* - a fit-test that uses an instrument to measure the challenge agent inside and outside the respirator (AFOSH STD 48-1, Attachment 1, Section C).
- *Regulated Area* - an area established by the installation to demarcate areas where airborne concentrations of cadmium exceed, or can reasonably be expected to exceed, the OEL (29 CFR 1910.1027(b)).

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### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
Occupational Exposure Limits	CD.10.1	27-5
Exposure Monitoring	CD.20.1 through CD.20.5	27-7
Regulated Areas	CD.30.1 through CD.30.5	27-9
Methods of Compliance	CD.40.1 through CD.40.8	27-11
Respiratory Protection	CD.50.1 through CD.50.7	27-15
Emergency Situations	CD.60.1 and CD.60.2	27-19
Protective Work Clothing and Equipment	CD.70.1 through CD.70.6	27-21
Hygiene Areas and Practices	CD.80.1 through CD.80.4	27-23
Housekeeping	CD.90.1 through CD.90.7	27-25
Medical Surveillance -- General	CD.100.1 through CD.100.9	27-27
Medical Surveillance -- Prior to 1 January 1999	CD.110.1 through CD.110.3	27-31
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Medical Removal Protection	CD.130.1 through CD.130.6	27-39
Medical Removal Protection Benefits (MRPB)	CD.140.1 through CD.140.4	27-41
Hazard Communication	CD.150.1 through CD.150.10	27-43
Recordkeeping	CD.160.1 through CD.160.5	27-47
Observation of Monitoring	CD.170.1 and CD.170.2	27-49
Appendix 27-1, <i>Respiratory Protection for Cadmium</i>		27-51



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<p><b>CD.10</b>  <b>OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>CD.10.1.</b> Installations must ensure that no personnel are exposed to airborne concentrations of cadmium in excess of a certain limit (29 CFR 1910.1027(c)).</p>	<p>(NOTE: AFOSH STD 48-8, <i>Controlling Exposures to Hazardous Substances</i>, requires the use of the most recent threshold limit values published in <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (that is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.)</p> <p>Verify that no personnel are exposed to airborne concentrations of cadmium in excess of <math>5 \mu\text{g}/\text{m}^3</math>, calculated as an 8-h TWA.</p>



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<p><b>CD.20 EXPOSURE MONITORING</b></p> <p><b>CD.20.1.</b> Installations are required to determine if personnel are exposed to cadmium at or above the action level (29 CFR 1910.1027(d)(1)).</p> <p><b>CD.20.2.</b> Periodic monitoring must be instituted under certain circumstances (29 CFR 1910.1027(d)(3)(i) and (d)(3)(ii)).</p> <p><b>CD.20.3.</b> Further exposure monitoring must be carried out in certain circumstances (29 CFR 1910.1027(d)(4)).</p>	<p>Verify that the installation carries out initial monitoring of personnel to determine exposure to cadmium.</p> <p>(NOTE: If the installation has monitored after 14 September 1991 under conditions that in all important aspects closely resemble those currently prevailing and if that monitoring satisfies all other requirements of Section L of this protocol, the installation may rely on such earlier monitoring to satisfy this requirement.)</p> <p>(NOTE: If the installation has objective data (see definitions) demonstrating that personnel exposure to cadmium will not exceed the action level under the expected conditions of processing, use, or handling, the installation may rely upon such data instead of implementing initial monitoring.)</p> <p>Determine whether initial or periodic monitoring reveals personnel exposures to be at or above the action level.</p> <p>Verify that the installation monitors at a frequency and pattern needed to ensure the adequacy of respiratory selection and the effectiveness of engineering and work practice controls.</p> <p>Verify that such exposure monitoring is performed at least every 6 mo.</p> <p>Verify that the installation, at a minimum, continues semiannual measurements unless and until the following conditions are met:</p> <ul style="list-style-type: none"> <li>- the initial monitoring or the periodic monitoring indicates that personnel exposures are below the action level</li> <li>- that result is confirmed by the results of another monitoring taken at least 7 days later.</li> </ul> <p>Verify that exposure monitoring is instituted in the following circumstances:</p> <ul style="list-style-type: none"> <li>- whenever there has been a change in the raw materials, equipment, personnel, work practices, or finished products that may result in additional personnel being exposed to cadmium at or above the action level</li> <li>- whenever such changes may result in personnel already exposed at the action level being exposed above the OEL</li> <li>- whenever the installation has any reason to suspect that any other change might result in such further exposure.</li> </ul>

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<b>CD.20.4.</b> Personnel must be notified of the results of monitoring (29 CFR 1910.1027(d)(4)).	<p>Verify that, within 15 working days after the receipt of monitoring results, personnel are notified individually and writing of those results.</p> <p>Verify that the installation also posts the results of the exposure monitoring in an appropriate location that is accessible to all affected personnel within 15 working days after the receipt of monitoring results.</p> <p>Verify that, if the monitoring results indicate that the OEL has been exceeded, the installation includes in the written notice a statement to that effect and a description of the corrective action being taken to reduce personnel exposure to or below the OEL.</p>
<b>CD.20.5.</b> Methods of monitoring and analysis are subject to specific requirements as to accuracy (29 CFR 1910.1027(d)(6)).	<p>Verify that the installation uses a method of monitoring and analysis that has an accuracy of not less than plus or minus 25 percent (<math>\pm 25</math> percent), with a confidence level of 95 percent, for airborne concentrations of cadmium at or above the action level or the OEL.</p>

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<p><b>CD.30</b>  <b>REGULATED AREAS</b></p> <p><b>CD.30.1.</b> Installations must establish regulated areas under certain circumstances (29 CFR 1910.1027(e)(1)).</p> <p><b>CD.30.2.</b> Regulated areas must be demarcated from the rest of the work-place (29 CFR 1910.1027(e)(2)).</p> <p><b>CD.30.3.</b> Access to regulated areas must be limited to authorized persons (29 CFR 1910.1027(e)(3)).</p> <p><b>CD.30.4.</b> Persons who enter regulated areas must wear respirators (29 CFR 1910.1027(e)(4)).</p> <p><b>CD.30.5.</b> Certain activities are prohibited in regulated areas (29 CFR 1910.1027(e)(5)).</p>	<p>Verify that the installation establishes a regulated area wherever the exposure of personnel to airborne concentrations of cadmium is or can reasonably be expected to be in excess of the OEL.</p> <p>Verify that regulated areas are demarcated from the rest of the workplace in a manner that adequately establishes and alerts personnel to the boundaries of the regulated area.</p> <p>Verify that access to regulated areas is limited to authorized persons.</p> <p>Verify that persons who enter regulated areas are supplied with and use respirators that meet the requirements of 29 CFR 1910.1027(g)(2) (see checklist items CD.50.2 and CD.50.3).</p> <p>Verify that the installation ensures that personnel do not:</p> <ul style="list-style-type: none"> <li>- eat, drink, or smoke in regulated areas</li> <li>- chew tobacco or gum in regulated areas</li> <li>- apply cosmetics in regulated areas</li> <li>- carry products associated with the above activities into regulated areas</li> <li>- store products associated with the above activities in regulated areas.</li> </ul>



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<p><b>CD.40</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>CD.40.1.</b> Installations must institute engineering and work practice controls (29 CFR 1910.1027(f)(1)(i) and (f)(1)(iii)).</p> <p><b>CD.40.2.</b> Installations must take certain actions in the event that engineering and work practice controls are required but are insufficient to reduce personnel exposure to or below the OEL (29 CFR 1910.1027(f)(1)(iv)).</p> <p><b>CD.40.3.</b> Installations may not use personnel rotation as a method of compliance (29 CFR 1910.1027(f)(1)(v)).</p> <p><b>CD.40.4.</b> Installations must establish and implement a written compliance program when the OEL is exceeded (29 CFR 1910.1027(f)(2)(i)).</p>	<p>Verify that the installation institutes engineering and work practice controls to reduce and maintain personnel exposure to cadmium at or below the OEL.</p> <p>(NOTE: This requirement does not apply to the extent that the installation can demonstrate that such controls are not feasible.)</p> <p>(NOTE: This requirement does not apply where the installation demonstrates the following:</p> <ul style="list-style-type: none"> <li>- the individual is only intermittently exposed, and</li> <li>- the individual is not exposed above the OEL on 30 or more days per year (12 consecutive months.)</li> </ul> <p>Verify that the installation implements engineering and work practice controls even though they are inadequate.</p> <p>Verify that the installation supplements such controls with respiratory protection that complies with the requirements of 29 CFR 1910.1027(g) (see checklist items CD.50.2 and CD.50.3) and the OEL.</p> <p>Verify that rotation of personnel is not used as a method of compliance.</p> <p>Determine whether the OEL is exceeded.</p> <p>Verify that the installation has a written compliance program and implements it.</p> <p>Verify that the installation includes the use of appropriate respiratory protection in the program if engineering and work practice controls cannot reduce personnel exposure to or below the OEL.</p> <p>Verify that the plan includes at least the following:</p> <ul style="list-style-type: none"> <li>- a description of each operation in which cadmium is emitted, including such information as: <ul style="list-style-type: none"> <li>- machinery used</li> <li>- material processed</li> <li>- controls in place</li> </ul> </li> </ul>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>EOH: CADMIUM</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
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	<ul style="list-style-type: none"> <li>- crew size</li> <li>- job responsibilities</li> <li>- operating procedures</li> <li>- maintenance practices</li> <li>- a description of the specific means that will be employed to achieve compliance, including:               <ul style="list-style-type: none"> <li>- engineering plans and studies used to determine methods selected for controlling exposure to cadmium</li> <li>- where necessary, use of appropriate respiratory protection to achieve the OEL</li> </ul> </li> <li>- a report of the technology considered in meeting the OEL</li> <li>- air monitoring data that document the sources of cadmium emissions</li> <li>- a detailed schedule for implementation of the program, including such documents as copies of purchase orders for equipment, construction contracts, etc.</li> <li>- a work practice program that includes items required under 29 CFR 1910.1027(h) through 1910.1027(j) (see the checklist items in CD.60, CD.70, and CD.80)</li> <li>- a written plan for emergency situations, as specified in 29 CFR 1910.1027(h) (see checklist item CD.60.1)</li> <li>- other relevant information.</li> </ul>
<b>CD.40.5.</b> Installations must review and update their written compliance programs in accordance with certain requirements (29 CFR 1910.1027 (f)(2)(iii) and (f)(2)(iv)).	<p>Verify that the written compliance program is reviewed and updated at least annually.</p> <p>Verify that the written compliance program is reviewed and updated more often if necessary to reflect significant changes in compliance status.</p> <p>Verify that the written compliance program is provided upon request for examination and copying to affected individuals, personnel representatives, the Assistant Secretary, and the Director.</p>
<b>CD.40.6.</b> Mechanical ventilation systems are subject to testing requirements (29 CFR 1910.1027 (f)(3)(i) and (f)(3)(ii)).	<p>Determine whether mechanical ventilation is used to control exposure.</p> <p>Verify that measurements are made as necessary to maintain its effectiveness.</p> <p>(NOTE: Such measurements are made to demonstrate the effectiveness of the system in controlling exposure and may include measurements of capture velocity, duct velocity, or static pressure.)</p> <p>Verify that such measurements are made as necessary within 5 working days of any change in production, process, or control that might result in a significant increase in personnel exposure to cadmium.</p>
<b>CD.40.7.</b> Specific requirements must be met if air from exhaust ventilation is recircu-	<p>Verify that the system has a high efficiency filter.</p>

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<p>lated into the workplace (29 CFR 1910.1027(f)(3)(iii)).</p> <p><b>CD.40.8.</b> Installations must develop and implement procedures to minimize exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted (29 CFR 1910.1027(f)(3)(iv)).</p>	<p>Verify that the system is monitored to ensure its effectiveness.</p> <p>Verify that the installation has developed and implemented procedures to minimize exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted.</p>



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<p><b>CD.50</b>  <b>RESPIRATORY PROTECTION</b></p> <p><b>CD.50.1.</b> The use of respirators is required in specific circumstances (29 CFR 1910.1027(g)(1)).</p> <p><b>CD.50.2.</b> Appropriate, approved respirators must be used when respirators are required (29 CFR 1910.1027(g)(2)(i)).</p> <p><b>CD.50.3.</b> Installations must provide a powered, air-purifying respirator (PAPR) in certain circumstances (29 CFR 1910.1027(g)(2)(ii)).</p> <p><b>CD.50.4.</b> Installations must institute a respiratory protection program where respiratory protection is required (29 CFR 1910.1027(g)(3)(i)).</p>	<p>Verify that respirators are used in the following circumstances:</p> <ul style="list-style-type: none"> <li>- where exposure levels exceed the OEL, during the time period necessary to install or implement feasible engineering and work practice controls</li> <li>- in those maintenance and repair activities and during those brief or intermittent operations where exposures exceed the OEL and engineering and work practice controls are not feasible or are not required</li> <li>- in regulated areas</li> <li>- where the installation has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the OEL</li> <li>- in emergencies</li> <li>- wherever an individual exposed to cadmium at or above the OEL requests a respirator</li> <li>- wherever an individual is exposed to cadmium above the OEL and engineering controls are not required under 29 CFR 1910.1027(f)(1)(iii) (see checklist item CD.40.1).</li> </ul> <p>Verify that appropriate respirators are selected from those specified in Appendix 27-1.</p> <p>Verify that the respirators are approved by MSHA and NIOSH as acceptable protection against cadmium dust, fume, and mist.</p> <p>Verify that the installation provides a PAPR in lieu of a negative pressure respirator wherever:</p> <ul style="list-style-type: none"> <li>- an individual entitled to a respirator chooses to use this type of respirator, and</li> <li>- this respirator will provide adequate protection to the individual.</li> </ul> <p>Determine whether the use of respirators is required.</p> <p>Verify that the installation institutes a respiratory protection program.</p> <p>Verify that the program meets the requirements of 29 CFR 1910.134 (see the checklist items in PE.30 through PE.120, excluding those items that are based solely on AFOSH STDs).</p>

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<p><b>CD.50.5.</b> The installation has specific responsibilities with regard to personnel who are required to use respirators (29 CFR 1910.1027(g)(3)(ii) through (g)(3)(v)).</p>	<p>Verify that each individual who is required to use an air-purifying respirator is permitted to leave the regulated area to change the filter element or replace the respirator whenever an increase in breathing resistance is detected.</p> <p>Verify that the installation maintains an adequate supply of filter elements.</p> <p>Verify that each individual who is required to wear a respirator is permitted to leave the regulated area to wash his or her face and the respirator facepiece whenever necessary to prevent skin irritation associated with respirator use.</p> <p>Verify that the installation makes a medical examination available to individuals who exhibit difficulty in breathing while wearing a respirator during a fit test or during use in order to determine if the individual can wear a respirator while performing the required duties.</p> <p>Verify that no individual is assigned a task requiring the use of a respirator if an examining physician determines that the individual will be unable to continue to function normally while wearing a respirator.</p> <p>Verify that removal from or limitation in the individual's current job is in accord with the requirements of 29 CFR 1910.1027(l)(11) and (l)(12) (see the checklist items in CD.130.1 through CD.140.1).</p>
<p><b>CD.50.6.</b> Installations must ensure that respirators issued to personnel fit properly and exhibit the least possible facepiece leakage (29 CFR 1910.1027(g)(4)(i)).</p>	<p>Verify that the installation ensures that respirators issued to personnel fit properly and exhibit the least possible facepiece leakage.</p>
<p><b>CD.50.7.</b> Installations must perform either qualitative or quantitative fit testing of respirators for certain individuals at specified times (29 CFR 1910.1027(g)(4)(ii)).</p>	<p>Verify that either qualitative or quantitative fit testing is carried out at the time of initial fitting and at least annually thereafter for the following:</p> <ul style="list-style-type: none"> <li>- each individual wearing a tight-fitting, air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that do not exceed 10 times the OEL</li> <li>- each individual wearing a tight-fitting, air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that exceed 10 times the OEL.</li> </ul> <p>Verify that quantitative fit testing is performed at the time of initial fitting and at least annually thereafter for each individual wearing a tight-fitting, supplied-air respirator or self-contained breathing apparatus.</p>

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	<p>Verify that, in each of the above instances, a fit factor that is at least 10 times the protection factor for that class of respirators (see Appendix 27-1) is achieved at testing.</p> <p>Verify that fit testing is conducted in accordance with Appendix C of 29 CFR 1910.1027.</p>



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<p><b>CD.60 EMERGENCY SITUATIONS</b></p> <p><b>CD.60.1.</b> Installations must develop a written plan for dealing with emergencies involving substantial releases of air-borne cadmium (29 CFR 1910.1027(h)).</p> <p><b>CD.60.2.</b> Installations must take certain actions in the event of an emergency (29 CFR 1910.1027(h)).</p>	<p>Verify that the installation has developed a plan for dealing with emergency situations.</p> <p>Verify that the plan includes provisions for the use of appropriate respirators and personal protective equipment.</p> <p>Verify that personnel not essential to correcting the emergency situation are restricted from the area.</p> <p>Verify that normal operations are halted in that area until the emergency is abated.</p>



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<p><b>CD.70</b>  <b>PROTECTIVE WORK CLOTHING AND EQUIPMENT</b></p> <p><b>CD.70.1.</b> Installations must provide appropriate protective work clothing and equipment under certain circumstances and ensure the use of it (29 CFR 1910.1027(i)(1)).</p> <p><b>CD.70.2.</b> Installations have specific responsibilities with regard to the removal and storage of protective clothing and equipment (29 CFR 1910.1027(i)(2)).</p>	<p>Verify that appropriate protective work clothing and equipment that prevents contamination of an individual and his/her garments is provided to:</p> <ul style="list-style-type: none"> <li>- personnel who are exposed to airborne cadmium above the OEL</li> <li>- personnel who experience skin or eye irritation at any level of exposure.</li> </ul> <p>Verify that the installation provides the protective work clothing and equipment at no cost to personnel.</p> <p>Verify that the installation ensures the use of the protective work clothing and equipment that it provides.</p> <p>(NOTE: Protective work clothing and equipment includes but is not limited to the following:</p> <ul style="list-style-type: none"> <li>- coveralls or similar full-body work clothing</li> <li>- gloves, head coverings, and boots or foot coverings</li> <li>- face shields, vented goggles, or other appropriate protective equipment that complies with the provisions of 29 CFR 1910.133 (see the checklist items in PE.20.)</li> </ul> <p>Verify that the installation ensures that:</p> <ul style="list-style-type: none"> <li>- personnel remove all protective clothing and equipment contaminated with cadmium at the completion of the work shift</li> <li>- such clothing and equipment is removed in change rooms that meet the requirement of 29 CFR 1910.1027(j)(1) (see checklist item CD.80.1)</li> <li>- no personnel take cadmium-contaminated protective clothing or equipment from the workplace, unless authorized to do so for purposes of laundering, cleaning, maintaining, or disposing of it at an appropriate location or facility away from the workplace</li> <li>- contaminated protective clothing and equipment, when removed for laundering, cleaning, maintenance, or disposal, is placed and stored in sealed, impermeable bags or other closed, impermeable containers that are designed to prevent dispersion of cadmium dust</li> <li>- bags or containers of contaminated protective clothing and equipment that are to be taken out of the change rooms or the workplace for laundering, cleaning, maintenance, or disposal are labeled in accordance with the requirements of 29 CFR 1910.1027(m)(3) (see checklist items CD.150.5 and CD.150.6).</li> </ul>

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<p><b>CD.70.3.</b> Installations must provide required protective clothing and equipment at least weekly (29 CFR 1910.1027 (i)(3)(ii)).</p>	<p>Verify that the installation provides required protective clothing and equipment in a clean and dry condition as often as necessary to maintain its effectiveness but, in any event, at least weekly.</p> <p>(NOTE: The installation is responsible for cleaning and laundering required protective clothing and equipment and for disposing of it.)</p>
<p><b>CD.70.4.</b> The installation must repair or replace required protective clothing and equipment as needed to maintain its effectiveness (29 CFR 1910.1027(i)(3)(ii)).</p>	<p>Verify that required protective clothing and equipment is repaired or replaced as needed to maintain its effectiveness.</p> <p>Verify that, when rips or tears are detected while an individual is working, such rips or tears are mended immediately.</p> <p>Verify that the worksuit is replaced immediately if rips or tears are not immediately mended.</p>
<p><b>CD.70.5.</b> The removal of cadmium from protective clothing and equipment by blowing, shaking, or any other means that disperses cadmium into the air is prohibited (29 CFR 1910.1027(i)(3)(iii)).</p>	<p>Verify that the installation forbids the removal of cadmium from protective clothing and equipment by blowing, shaking, or any other means that disperses cadmium into the air.</p>
<p><b>CD.70.6.</b> Installations have specific responsibilities with regard to the laundering and cleaning of contaminated protective clothing and equipment (29 CFR 1910.1027 (i)(3)(iv) and (i)(3)(v)).</p>	<p>Verify that the installation ensures that any laundering of contaminated clothing or cleaning of contaminated equipment in the workplace is done in a manner that pre-vents the release of airborne cadmium in excess of the OEL.</p> <p>Verify that the installation informs any person who launders or cleans protective clothing or equipment contaminated with cadmium of the potentially harmful effects of exposure to cadmium.</p> <p>Verify that the installation informs any person who launders or cleans protective clothing or equipment contaminated with cadmium that such items should be laundered or cleaned in such a way as to prevent the release of airborne cadmium in excess of the OEL.</p>

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<p><b>CD.80</b>  <b>HYGIENE AREAS AND PRACTICES</b></p> <p><b>CD.80.1.</b> Installations must provide clean change rooms, handwashing facilities, showers, and lunchrooms for the use of personnel whose exposure to airborne cadmium is above the OEL (29 CFR 1910.1027(j)(1)).</p> <p><b>CD.80.2.</b> Change rooms must meet specific requirements (29 CFR 1910.1027(j)(2)).</p> <p><b>CD.80.3.</b> Installations must ensure that personnel who are exposed to cadmium above the OEL observe certain hygienic practices (29 CFR 1910.1027(j)(3)).</p> <p><b>CD.80.4.</b> Installations must meet specific requirements with regard to lunchroom facilities (29 CFR 1910.1027(j) (4)).</p>	<p>Verify that the installation provides clean change rooms, handwashing facilities, showers, and lunchrooms.</p> <p>Verify that such facilities meet the requirements of 29 CFR 1910.141.</p> <p>Verify that change rooms are equipped with separate storage facilities for street clothes and protective clothing and equipment.</p> <p>Verify that such storage facilities are designed to prevent dispersion of cadmium and contamination of street clothes.</p> <p>Verify that the installation ensures that personnel who are exposed to cadmium above the OEL shower during the end of the work shift.</p> <p>Verify that the installation ensures that such personnel wash their hands and faces prior to eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.</p> <p>Verify that lunchroom facilities are readily accessible to personnel.</p> <p>Verify that tables for eating are maintained free of cadmium.</p> <p>Verify that no individual in a lunchroom is exposed at any time to cadmium at or above a concentration of 2.5 µg/m<sup>3</sup>.</p> <p>Verify that personnel do not enter lunchrooms with protective work clothing or equipment.</p> <p>(NOTE: This requirement does not apply if surface cadmium has been removed from the clothing and equipment by HEPA vacuuming or some other method that removes cadmium dust without dispersing it.)</p>



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<p><b>CD.90</b>  <b>HOUSEKEEPING</b></p> <p><b>CD.90.1.</b> All surfaces must be maintained as free as practicable of accumulations of cadmium (29 CFR 1910.1027 (k)(1)).</p> <p><b>CD.90.2.</b> All spills and sudden releases of material that contains cadmium must be cleaned up as soon as possible (29 CFR 1910.1027(k)(2)).</p> <p><b>CD.90.3.</b> Surfaces contaminated with cadmium must be cleaned using certain methods (29 CFR 1910.1027(k)(3)).</p> <p><b>CD.90.4.</b> Vacuuming practices must meet specific requirements (29 CFR 1910.1027(k)(4)).</p> <p><b>CD.90.5.</b> Shoveling, dry or wet sweeping, and brushing must not be used in housekeeping under certain circumstances (29 CFR 1910.1027(k)(5)).</p> <p><b>CD.90.6.</b> Compressed air must not be used to remove cadmium from any surface (29 CFR 1910.1027(k)(6)).</p>	<p>Verify that all surfaces are maintained as free as practicable of accumulations of cadmium.</p> <p>Verify that all spills and sudden releases of material that contains cadmium are cleaned up as soon as possible.</p> <p>Verify that surfaces contaminated with cadmium are, whenever possible, cleaned by vacuuming or some other method that minimizes the likelihood of cadmium becoming airborne.</p> <p>Verify that HEPA-filtered vacuuming equipment or equally effective filtration methods are used for vacuuming.</p> <p>Verify that equipment is used and emptied in a manner that minimizes the reentry of cadmium into the workplace.</p> <p>Verify that shoveling, dry or wet sweeping, and brushing are not used if vacuuming or other methods that minimize the likelihood of cadmium becoming airborne can be used effectively.</p> <p>Verify that no one uses compressed air to remove cadmium from any surface.</p> <p>(NOTE: This prohibition does not apply if the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.)</p>

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<b>CD.90.7.</b> Waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal must be collected and disposed of in accordance with specific requirements (29 CFR 1910.1027(k)(7)).	<p>Verify that waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal are collected and disposed of in sealed, impermeable bags or other closed, impermeable containers.</p> <p>Verify that these bags and containers are labeled in accordance with the provisions of 29 CFR 1910.1027(m)(3) (see checklist items CD.150.5 and CD.150.6).</p>

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<p><b>CD.100 MEDICAL SURVEILLANCE -- GENERAL</b></p> <p><b>CD.100.1.</b> Installations must institute medical surveillance programs for certain personnel (29 CFR 1910.1027(l)(1)(i)).</p> <p><b>CD.100.2.</b> Limited medical examinations must be provided to determine an individual's fitness for using a respirator (29 CFR 1910.1027(l)(1)(ii)).</p> <p><b>CD.100.3.</b> All required medical examinations and procedures are subject to certain requirements (29 CFR 1910.1027(l)(1)(iii)).</p> <p><b>CD.100.4.</b> Installations must meet specific requirements with regard to biological samples taken from personnel</p>	<p>Verify that medical surveillance programs have been instituted for personnel who are or may be exposed to cadmium at or above the action level.</p> <p>(NOTE: This requirement does not apply if the installation demonstrates that the individual is not, and will not be, exposed at or above the action level on 30 or more days per yr (12 consecutive mo).)</p> <p>Verify that medical surveillance programs have been instituted for personnel who, prior to 14 December 1992, might previously have been exposed to cadmium at or above the action level by the installation.</p> <p>(NOTE: This requirement does not apply if the installation demonstrates that the individual did not, prior to 14 December 1992, work for the installation in jobs with exposure to cadmium for an aggregated total of more than 60 mo.)</p> <p>Verify that the installation provides limited medical examinations to determine an individual's fitness for using a respirator.</p> <p>Verify that the examinations meet the requirements of 29 CFR 1910.1027(l)(6) (see checklist item CD.120.7).</p> <p>Verify that all required medical examinations and procedures are performed by or under the supervision of a licensed physician who has read and is familiar with the following:</p> <ul style="list-style-type: none"><li>- the health effects section of Appendix A of 29 CFR 1910.1027</li><li>- the regulatory text of 29 CFR 1910.1027</li><li>- the protocol for sample handling and laboratory selection in Appendix F of 29 CFR 1910.1027</li><li>- the questionnaire of Appendix D of 29 CFR 1910.1027.</li></ul> <p>Verify that all required medical examinations and procedures are provided without cost to personnel and at times and places that are reasonable and convenient to personnel.</p> <p>Verify that the installation ensures that biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (<math>\beta_2</math>-M) taken from personnel are:</p>

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<p>(29 CFR 1910.1027(l)(1)(iv)).</p> <p><b>CD.100.5.</b> Installations must provide initial (pre-placement) examinations to certain personnel (29 CFR 1910.1027(l)(2)(i)).</p> <p><b>CD.100.6.</b> Initial examinations must meet specific requirements with regard to contents (29 CFR 1910.1027(l)(2)(ii)).</p> <p><b>CD.100.7.</b> The installation must take specific actions with regard to personnel whose medical monitoring results are at or below specified levels (29 CFR 1910.1027(l)(3)(i)).</p>	<ul style="list-style-type: none"> <li>- collected and handled in a manner that ensures their reliability</li> <li>- analyzed in laboratories with demonstrated proficiency for the particular analyte.</li> </ul> <p>Verify that installations provide initial (preplacement) examinations to personnel who are required to take part in a medical surveillance program (see checklist item CD.100.1).</p> <p>Verify that the examination is provided within 30 days after initial assignment to a job with exposure to cadmium.</p> <p>Verify that the initial (preplacement) examination includes the following:</p> <ul style="list-style-type: none"> <li>- a detailed medical and work history, with emphasis on: <ul style="list-style-type: none"> <li>- past, present, and anticipated future exposure to cadmium</li> <li>- any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculoskeletal dysfunction</li> <li>- current usage of medication with potential nephrotoxic side-effects</li> <li>- smoking history and current status</li> </ul> </li> <li>- biological monitoring that includes the following tests: <ul style="list-style-type: none"> <li>- cadmium in urine (CdU), standardized to grams of creatinine (g/Cr)</li> <li>- beta-2 microglobulin in urine (<math>\beta_2</math>-M), standardized to g/Cr, with pH specified</li> <li>- cadmium in blood (CdB), standardized to liters of whole blood (lwb).</li> </ul> </li> </ul> <p>(NOTE: The installation is not required to provide an initial examination if the individual has been examined in accordance with the requirements of 29 CFR 1910.1027(l)(2)(ii) (see checklist item CD.100.6) within the past 12 mo. In that case, the relevant records must be maintained as part of the individual's medical record and the prior examination is treated as if it were an initial examination.)</p> <p>Determine whether there are any personnel whose monitoring results meet the following criteria:</p> <ul style="list-style-type: none"> <li>- CdU level at or below 3 <math>\mu</math>g/g Cr</li> <li>- <math>\beta_2</math>-M level at or below 300 <math>\mu</math>g/g Cr</li> <li>- CdB level at or below 5 <math>\mu</math>g/lwb.</li> </ul> <p>Verify that the installation provides to such individuals who are both currently exposed and subject to medical monitoring (see checklist item CD.100.1) the minimum level of periodic medical surveillance in accordance with 29 CFR 1910.1027(l)(4)(i) (see checklist item CD.120.1).</p> <p>Verify that the installation provides to such individuals who were previously exposed and are subject to medical monitoring (see checklist item CD.100.1) biological monitoring for CdU, <math>\beta_2</math>-M, and CdB for 1 yr.</p>

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<p><b>CD.100.8.</b> The installation must take specific actions with regard to personnel whose medical monitoring results exceed specified levels (29 CFR 1910.1027(l)(3)(ii)(A) and (l)(3)(ii)(B)).</p>	<p>Verify that the installation complies with the requirements of 29 CFR 1910.1027(l)(4)(v) (see checklist item CD.120.5) after that year-long period ends.</p> <p>Determine whether there are any personnel who are subject to medical monitoring (see checklist item CD.100.1) and whose monitoring results meet the following criteria:</p> <ul style="list-style-type: none"> <li>- CdU level above 3 µg/g Cr</li> <li>- β<sub>2</sub>-M level above 300 µg/g Cr</li> <li>- CdB level above 5 µg/lwb.</li> </ul> <p>Verify that the installation reassesses such an individual's occupational exposure to cadmium as follows within 2 weeks after receipt of the biological monitoring results:</p> <ul style="list-style-type: none"> <li>- reassess the individual's work practices and personal hygiene</li> <li>- reevaluate the individual's respirator use, if any, and the respirator program</li> <li>- review the hygiene facilities</li> <li>- reevaluate the maintenance and effectiveness of the relevant engineering controls</li> <li>- assess the individual's smoking history and status.</li> </ul> <p>Verify that, within 30 days after the above exposure reassessment, the installation takes reasonable steps to correct any deficiencies found in the course of that reassessment that may be responsible for the individual's exposure to cadmium.</p> <p>Verify that, within 90 days after receipt of biological monitoring results, the installation provides a full medical examination to the affected individual in accordance with the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2).</p> <p>(NOTE: This examination is used by the examining physician as a basis for determining whether the individual is subject to medical removal.)</p> <p><b>CD.100.9.</b> Installations must take specific actions with regard to personnel for whom medical removal is not deemed necessary (29 CFR 1910.1027(l)(3)(ii)(C)).</p> <p>Verify that the installation provides such individuals with semiannual biological monitoring of CdU, β<sub>2</sub>-M, and CdB.</p> <p>Verify that the installation provides an annual medical examination that meets the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2).</p> <p>Verify that semiannual biological monitoring and annual medical examinations are continued until the affected individual's monitoring results meet the following criteria:</p> <ul style="list-style-type: none"> <li>- CdU level at or below 3 µg/g Cr</li> <li>- β<sub>2</sub>-M level at or below 300 µg/g Cr</li> <li>- CdB level at or below 5 µg/lwb.</li> </ul>



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<p><b>CD.110</b>  <b>MEDICAL SURVEILLANCE -- PRIOR TO 1 JANUARY 1999</b></p> <p><b>CD.110.1.</b> Installations must take specific actions with regard to all personnel who are subject to medical monitoring if biological monitoring results exceed specified limits (29 CFR 1910.1027(l)(3)(iii)).</p> <p><b>CD.110.2.</b> Medical removal of affected personnel is required under certain circumstances (29 CFR 1910.1027(l)(3) (iii)).</p> <p><b>CD.110.3.</b> The installation has specific responsibilities with regard to persons who are not required to be removed under the provisions of 29 CFR 1910.1027(l)(3)(iii) or by the physician's determination (29 CFR 1910.1027(l)(3)(iii)).</p>	<p>(NOTE: These requirements apply for all personnel subject to medical surveillance through 31 December 1998. New requirements will take effect on 1 January 1999.)</p> <p>Determine whether the biological monitoring results of any personnel show levels in excess of any of the following:</p> <ul style="list-style-type: none"> <li>- CdU level above 15 µg/g Cr</li> <li>- β<sub>2</sub>-M level above 1500 µg/g Cr</li> <li>- CdB level above 15 µg/lwb.</li> </ul> <p>Verify that the installation complies with the requirements of 29 CFR 1910.1027(l)(3)(ii)(A) and 1910.1027(l)(3)(ii)(B) (see checklist item CD.100.8).</p> <p>Determine whether the biological monitoring results and the results obtained during the medical examination both show the following levels:</p> <ul style="list-style-type: none"> <li>- CdU level above 15 µg/g Cr or</li> <li>- β<sub>2</sub>-M level above 1500 µg/g Cr or</li> <li>- CdB level above 15 µg/lwb and</li> <li>- CdU level above 15 µg/g Cr or CdB level above 5 µg/lwb.</li> </ul> <p>Verify that the individual is removed from exposure to cadmium at or above the action level.</p> <p>(NOTE: If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the individual is not required to be removed.)</p> <p>Verify that the installation:</p> <ul style="list-style-type: none"> <li>- periodically reassesses the individual's occupational exposure to cadmium</li> <li>- provides quarterly biological monitoring that includes the elements specified in 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6)</li> <li>- provides semiannual medical examinations that meet the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2).</li> </ul>



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<p><b>CD.120</b>  <b>PERIODIC MEDICAL SURVEILLANCE</b></p> <p><b>CD.120.1.</b> Installations must provide at least a minimum level of periodic surveillance to personnel (29 CFR 1910.1027(l)(4)(i) and (l)(4)(vi)).</p> <p><b>CD.120.2.</b> The periodic medical exam must meet certain requirements as to contents (29 CFR 1910.1027(l)(4)(ii)).</p>	<p>(NOTE: The requirements of 29 CFR 1910.1027(l)(4) (i.e., checklist items CD.120.1 through CD.120.5) apply to personnel who are or may be exposed to cadmium at or above the action level. They do not apply if the installation demonstrates that the individual is not, and will not be, exposed at or above the action level on 30 or more days per yr (12 consecutive mo).)</p> <p>Verify that the installation provides at least a minimum level of periodic surveillance to personnel.</p> <p>(NOTE: The minimum level of periodic medical surveillance consists of periodic medical examinations and periodic biological monitoring.)</p> <p>Verify that a periodic medical examination is provided within 1 yr after the initial examination and at least biennially thereafter.</p> <p>(NOTE: Routine, biennial medical examinations are not required if adequate medical records show that the individual has been examined in accordance with the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2) within the past 12 mo. In that case, such records are to be maintained by the installation as part of the individual's medical record, and the next routine medical examination is to be made available to the individual within 2 yr of the previous examination.)</p> <p>Verify that biological sampling is provided at least annually.</p> <p>(NOTE: Biological monitoring may be provided as part of a periodic medical examination or separately as periodic biological monitoring.)</p> <p>Verify that the periodic medical examination includes:</p> <ul style="list-style-type: none"> <li>- a detailed medical and work history or update thereof, with emphasis on: <ul style="list-style-type: none"> <li>- past, present, and anticipated future exposure to cadmium</li> <li>- smoking history and current status</li> <li>- reproductive history</li> <li>- current usage of medication with potential nephrotoxic side-effects</li> <li>- any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculoskeletal dysfunction</li> <li>- as part of the medical and work history, for personnel who wear respirators, questions 3 through 11 and 25 through 32 of Appendix D to 29 CFR 1910.1027</li> </ul> </li> <li>- a complete physical examination, with emphasis on blood pressure, the respiratory system, and the urinary system</li> <li>- a 14 by 17 in. [35.56 x 43.18 cm], or a reasonably standard sized posterior-anterior chest x-ray</li> <li>- pulmonary function tests, including FVC and FEV at 1 s (FEV1)</li> </ul>

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<p><b>CD.120.3.</b> Installations must provide periodic biological monitoring that meets certain standards (29 CFR 1910.1027(l)(4)(iii)).</p> <p><b>CD.120.4.</b> Installations must take specific actions with respect to the results of periodic biological monitoring performed on currently exposed personnel (29 CFR 1910.1027(l)(4)(iv)).</p> <p><b>CD.120.5.</b> Installations must take specific actions with respect to the results of periodic biological monitoring performed on previously exposed personnel (29 CFR 1910.1027(l)(4)(v)).</p>	<ul style="list-style-type: none"> <li>- biological monitoring as required by 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6)</li> <li>- blood analysis in addition to that required by 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6), including blood urea nitrogen, complete blood count, and serum creatinine</li> <li>- urinalysis, in addition to that required by 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6), including the determination of albumin, glucose, and total and low molecular weight proteins</li> <li>- for males over 40 yr old, prostate palpitation, or other at least as effective diagnostic test(s) and</li> <li>- any additional tests deemed necessary by the examining physician.</li> </ul> <p>(NOTE: The frequency of chest x-rays is to be determined by the examining physician.)</p> <p>Verify that the installation provides biological monitoring that includes the following tests:</p> <ul style="list-style-type: none"> <li>- cadmium in urine (CdU), standardized to grams of creatinine (g/Cr)</li> <li>- beta-2 microglobulin in urine (<math>\beta_2</math>-M), standardized to g/Cr, with pH specified</li> <li>- cadmium in blood (CdB), standardized to liters of whole blood (lwb).</li> </ul> <p>Determine whether the results of periodic monitoring show the level of the individual's CdU, <math>\beta_2</math>-M, or CdB to be in excess of the limits specified in 29 CFR 1910.1027(l)(3)(iii) (see checklist item CD.110.1).</p> <p>Verify that the installation takes action as appropriate to the circumstances of each individual case given those requirements.</p> <p>Determine whether the results for CdU, CdB, and <math>\beta_2</math>-M were in excess of but no longer exceed the following:</p> <ul style="list-style-type: none"> <li>- CdU level above 3 <math>\mu</math>g/g Cr</li> <li>- <math>\beta_2</math>-M level above 300 <math>\mu</math>g/g Cr</li> <li>- CdB level above 5 <math>\mu</math>g/lwb.</li> </ul> <p>Verify that the installation provides biological monitoring for CdU, CdB, and <math>\beta_2</math>-M for one year after the most recent test results.</p> <p>(NOTE: All periodic monitoring may be discontinued if the follow-up monitoring confirms the previous results.)</p>

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<p><b>CD.120.6.</b> Installations must reassess personnel exposure to cadmium and take specified actions if the results of a medical examination indicate any finding consistent with cadmium toxicity that does not require action under the requirements of other items in this protocol (29 CFR 1910.1027(l)(5)(i)).</p> <p><b>CD.120.7.</b> Installations must determine an individual's fitness for respirator use (29 CFR 1910.1027(l)(6)(i)).</p>	<p>Determine whether the results of the follow-up tests indicate that the level of the individual's CdU, CdB, and <math>\beta_2</math>-M are in excess of the above levels.</p> <p>Verify that the installation provides annual medical examinations in accordance with 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2) until the results of biological monitoring are consistently below those levels or until the examining physician determines in a written medical opinion that further medical surveillance is not required to protect the individual's health.</p> <p>(NOTE: All periodic medical surveillance may be discontinued for previously exposed personnel whose levels of CdU did not exceed 3 <math>\mu</math>g/g Cr, <math>\beta_2</math>-M did not exceed 300 <math>\mu</math>g/g Cr, and CdB did not exceed 5 <math>\mu</math>g/lwb in the initial biological monitoring, if the results of the follow-up monitoring confirm the previous results.)</p> <p>Determine whether the results of a medical examination indicate any laboratory or clinical finding consistent with cadmium toxicity that does not require action under the requirements of 29 CFR 1910.1027(l)(2), (l)(3), or (l)(4) (see checklist items CD.100.5 through CD.120.5).</p> <p>Verify that, within 30 days, the installation reassesses the individual's occupational exposure to cadmium and takes all of the following actions until the physician determines they are no longer necessary:</p> <ul style="list-style-type: none"> <li>- periodically reassess: <ul style="list-style-type: none"> <li>- the individual's work practices and personal hygiene</li> <li>- the individual's respirator use, if any</li> <li>- the individual's smoking history and status</li> <li>- the respiratory protection program</li> <li>- the hygiene facilities</li> <li>- the maintenance and effectiveness of the relevant engineering controls</li> </ul> </li> <li>- take all reasonable steps to correct the deficiencies found in the reassessment that may be responsible for the individual's excess exposure to cadmium</li> <li>- provide semiannual medical reexaminations to evaluate the abnormal clinical sign(s) of cadmium toxicity until the results are normal or the individual is medically removed</li> <li>- where the results of tests for total protein in urine are abnormal, provide a more detailed medical evaluation of the toxic effects of cadmium on the individual's renal system.</li> </ul> <p>Verify that the installation provides a medical examination to determine fitness for respirator use prior to the individual's being assigned to a job that requires the use of a respirator.</p>

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	<p>Verify that the examination includes the following:</p> <ul style="list-style-type: none"> <li>- a detailed medical and work history or update thereof, with emphasis on: <ul style="list-style-type: none"> <li>- past exposure to cadmium</li> <li>- smoking history and current status</li> <li>- any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculoskeletal dysfunction</li> </ul> </li> <li>- a description of the job for which the respirator is required</li> <li>- questions 3 through 11 and 25 through 32 of Appendix D to 29 CFR 1910.1027</li> <li>- a blood pressure test</li> <li>- biological monitoring of CdU, CdB, and <math>\beta_2</math>-M in accordance with 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6), unless such results already have been obtained within the previous 12 mo and</li> <li>- any other test that the examining physician deems appropriate.</li> </ul> <p>Verify that the installation provides a periodic medical examination in accordance with the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2) whenever an individual has exhibited difficulty in breathing during a respirator fit test or during use of a respirator.</p> <p>Verify that medical limitation or prohibition of respirator use are considered when the results of the above examination are abnormal.</p> <p>Verify that the individual's ability to wear a respirator is periodically evaluated by a physician if an individual whose examination results are considered abnormal is permitted to wear a respirator.</p>
<b>CD.120.8.</b> Installations must provide emergency examinations to any personnel who may have been acutely exposed to cadmium because of an emergency (29 CFR 1910.1027(l)(7)).	<p>Verify that the installation provides emergency examinations as soon as possible to any personnel who may have been acutely exposed to cadmium because of an emergency.</p> <p>Verify that the examination meets the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2), with emphasis on the respiratory system, other organ systems considered appropriate by the examining physician, and symptoms of acute over exposure, as identified in paragraphs II(B)(1)-(2) of Appendix A to 29 CFR 1910.1027.</p>
<b>CD.120.9.</b> Installations must provide medical examinations to certain personnel at termination of employment (29 CFR 1910.1027(l)(8)).	<p>Verify that the installation provides a medical examination at termination of employment to any individual to whom the installation was required to provide medical surveillance.</p> <p>Verify that the examination includes a chest x-ray.</p>

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<p><b>CD.120.10.</b> Installations must provide certain information to the examining physician (29 CFR 1910.1027(l)(9) and (l)(10)(iii)).</p> <p><b>CD.120.11.</b> Installations must obtain written, signed medical opinions from the examining physician for each medical examination performed on each individual (29 CFR 1910.1027(l)(10)(i)).</p> <p><b>CD.120.12.</b> The written signed medical opinion from the examining physician is subject to specific requirements as to its contents (29 CFR 1910.1027(l)(10)(i)).</p>	<p>(NOTE: No further examination is required if the last examination satisfied the requirements of 29 CFR 1910.1027(l)(4)(ii) (see checklist item CD.120.2) and was less than 6 mo prior to the date of termination, unless otherwise required by the provisions of 29 CFR 1910.1027(l)(3) or 1910.1027(l)(5) (see checklist items CD.100.7 through CD.110.3 or CD.120.6).)</p> <p>(NOTE: No termination of employment medical examination is required for personnel who might previously have been exposed by the installation to cadmium at or above the action level prior to 14 December 1992, if the installation demonstrates that the individuals did not prior to that date work for the installation in jobs with exposure to cadmium for an aggregated total of more than 60 mo.)</p> <p>Verify that the installation provides the following information to the examining physician:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1027 and its appendices</li> <li>- a description of the affected individual's former, current, and anticipated duties as they relate to his/her occupational exposure to cadmium</li> <li>- the affected individual's former, current, and anticipated future levels of exposure to cadmium</li> <li>- a description of any personal protective equipment, including respirators, used or to be used by the individual, including when and for how long the individual has used that equipment</li> <li>- relevant results of previous biological monitoring and medical examinations</li> <li>- instructions not to reveal orally or in his/her written medical opinion given to the installation specific findings or diagnoses unrelated to occupational exposure to cadmium.</li> </ul> <p>Verify that the installation promptly obtains a written, signed medical opinion from the examining physician for each medical examination performed on each individual.</p> <p>Verify that the written opinion contains the following:</p> <ul style="list-style-type: none"> <li>- the physician's diagnosis for the affected individual</li> <li>- the physician's opinion as to whether the individual has any detected medical condition(s) that would place him/her at risk of material impairment to health from further exposure to cadmium, including any indications of potential cadmium toxicity</li> <li>- the results of any biological or other testing or related evaluations that directly assess the individual's absorption of cadmium</li> </ul>

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<b>CD.120.13.</b> Installations must obtain a copy of the results of any biological monitoring provided to personnel independently of a medical examination (29 CFR 1910.1027(l)(10)(ii)).	<ul style="list-style-type: none"> <li>- any recommended removal from, or limitations on, the activities or duties of the individual or on the individual's use of personal protective equipment, such as respirators</li> <li>- a statement that the physician has clearly and carefully explained to the individual:             <ul style="list-style-type: none"> <li>- the results of the medical examination, including all biological monitoring results and any medical conditions related to cadmium exposure that require further evaluation or treatment</li> <li>- any limitation on the individual's diet or use of medications.</li> </ul> </li> </ul> <p>Verify that the installation promptly obtains a copy of the results of any biological monitoring provided to personnel independently of a medical examination.</p> <p>Verify that the installation also obtains an explanation sheet explaining those results.</p> <p>(NOTE: The explanation sheet is obtained in lieu of a written medical opinion.)</p>

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<p><b>CD.130</b>  <b>MEDICAL REMOVAL PROTECTION</b></p> <p><b>CD.130.1.</b> Installations must temporarily remove personnel from work where there is excess exposure to cadmium (29 CFR 1910.1027(l)(11)(i) (A) and 1910.1027(l)(11)(i) (B)).</p> <p><b>CD.130.2.</b> Medically removed personnel must be transferred to jobs where the exposure to cadmium is within specified levels (29 CFR 1910.1027(l) (11)(i)(C)).</p> <p><b>CD.130.3.</b> Installations must provide certain removed personnel with follow-up monitoring that meets specific requirements (29 CFR 1910.1027(l)(11)(i)(D)).</p>	<p>Verify that the installation temporarily removes personnel from work where there is excess exposure to cadmium in the following circumstances:</p> <ul style="list-style-type: none"> <li>- on each occasion that medical removal is required under the conditions of 29 CFR 1910.1027(l)(3), (l)(4), or (l)(6) (see checklist items CD.100.7 through CD.110.3, CD.120.1 through CD.120.5, or CD.120.7)</li> <li>- on each occasion that a physician determines in a written medical opinion that the individual should be removed from exposure.</li> </ul> <p>(NOTE: The physician's determination may be based on biological monitoring results, inability to wear a respirator, evidence of illness, other signs or symptoms of cadmium-related dysfunction or disease, or any other reason deemed medically sufficient by the physician.)</p> <p>Verify that individuals are removed regardless of whether, at the time of the removal, a job is available into which the removed individual can be transferred</p> <p>Verify that, whenever an individual is medically removed, the installation transfers the removed individual to a job (as soon as one becomes available) where the exposure to cadmium is within the permissible levels specified in 29 CFR 1910.1027(l)(11) (see checklist item CD.130.6).</p> <p>Verify that the installation provides follow-up biological monitoring to personnel who have been medically removed.</p> <p>Verify that the follow-up biological monitoring meets the requirements of 29 CFR 1910.1027(l)(2)(ii)(B) (see checklist item CD.100.6).</p> <p>Verify that the follow-up biological monitoring is provided at least every 3 mo.</p> <p>Verify that follow-up medical examinations are provided semi-annually at least every 6 mo.</p> <p>(NOTE: Follow-up biological monitoring and medical examinations may cease when a written opinion by the examining physician determines either that the individual may be returned to his/her former job status or that the individual must be permanently removed from excess cadmium exposure.)</p>

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<p><b>CD.130.4.</b> Installations must not return medically removed personnel to their former job status until a physician permits (29 CFR 1910.1027(l)(11)(i)(E)).</p>	<p>Verify that the installation does not return personnel who have been medically removed for any reason to their former job status until a physician has determined in a written medical opinion that continued medical removal is no longer necessary to protect their health.</p>
<p><b>CD.130.5.</b> Installations must remove personnel from work where exposure to cadmium is above certain levels in specific circumstances (29 CFR 1910.1027(l)(11)(ii) and (l)(11)(iii)).</p>	<p>Verify that personnel who have been found unfit to wear respirators are removed from work where exposure to cadmium is above the OEL.</p> <p>Verify that, where removal is based on any reason other than the individual's inability to wear a respirator, the installation removes the individual from work where exposure to cadmium is at or above the action level.</p>
<p><b>CD.130.6.</b> Personnel removed because their CdU, CdB, and/or <math>\beta_2</math>-M levels exceed specified triggers may be returned to work only under certain circumstances (29 CFR 1910.1027(l)(11)(iv) and (l)(11)(v)).</p>	<p>Verify that personnel who were removed because their CdU, CdB, and/or <math>\beta_2</math>-M levels exceed the triggers specified in 29 CFR 1910.1027(l)(3) or (l)(4) (see checklist items CD.100.8 and CD.120.5) are returned to work with exposure to cadmium at or above the action level only after their levels have fallen to or below the following:</p> <ul style="list-style-type: none"> <li>- CdU level: 3 <math>\mu\text{g/g Cr}</math></li> <li>- <math>\beta_2</math>-M level: 300 <math>\mu\text{g/g Cr}</math></li> <li>- CdB level: 5 <math>\mu\text{g/lwb}</math>.</li> </ul> <p>(NOTE: When in the examining physician's opinion, continued exposure to cadmium will not pose an increased risk to the individual's health, and there are special circumstances that make continued medical removal an inappropriate remedy, the physician may return a worker to his/her former job status despite what would otherwise be unacceptably high biological monitoring results.)</p> <p>Verify that the installation continues to provide medical surveillance to personnel who are returned to their former job status under the conditions foreseen in the above note as if they were still on medical removal until their levels fall to or below the limits in this checklist item.</p>

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<p><b>CD.140</b>  <b>MEDICAL REMOVAL PROTECTION BENEFITS (MRPB)</b></p> <p><b>CD.140.1.</b> Installations must provide MRPB (29 CFR 1910.1027(l)(12)(i), (l)(12)(iv), and (l)(11)(vi)).</p> <p><b>CD.140.2.</b> Installations must take specific actions after 18 mo of medical removal because of elevated biological monitoring results (29 CFR 1910.1027(l)(12)(iii), (l)(13), and (l)(14)).</p>	<p>(NOTE: The requirement that the installation provide MRPB means that the installation maintains the total normal earnings, seniority, and all other rights and benefits of the removed individual, including the right to his/her former job status, as if the individual had not been removed from his/her job or otherwise medically limited.)</p> <p>Verify that the installation provides MRPB for up to a maximum of 18 mo to an individual each time and while the individual is temporarily medically removed under 29 CFR 1910.1027(l)(11) (see checklist items CD.130.1 and CD.130.5).</p> <p>(NOTE: Where an installation, although not required by 29 CFR 1910.1027(l)(11)(i) through 1910.1027(l)(11)(iii) (see checklist items CD.130.1 and CD.130.5) to do so, removes an individual from exposure to cadmium or otherwise places limitations on an individual due to the effects of cadmium exposure on the individual's medical condition, the installation must still provide the MRPB to that individual as would have been provided had the removal been required under the terms of those paragraphs.)</p> <p>Verify that the installation provides MRPB as required under the terms of the above note.</p> <p>(NOTE: Installations may condition the provision of MRPB upon the individual's participation in medical surveillance provided in accordance with the requirements of this protocol.)</p> <p>Determine whether, after 18 mo on medical removal because of elevated biological monitoring results, the individual's results have not declined to a level low enough to permit him/her to return to her former job status.</p> <p>Verify that the installation makes available a medical examination in order to obtain a final medical determination as to whether the individual may be returned to his/her former job status or must be permanently removed from excess cadmium exposure.</p> <p>Verify that the installation ensures that the final medical determination indicates whether the individual may be returned to his/her former job status and what steps, if any, should be taken to protect the individual's health.</p> <p>(NOTE: If the installation selects the initial physician who conducts medical examinations or consultations provided to personnel, the affected individual may designate a second physician to review any findings, and to conduct such examinations, as the second physician considers necessary to facilitate review.)</p>

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<p><b>CD.140.3.</b> Installations must provide examined personnel with specific information (29 CFR 1910.1027(l)(15)).</p>	<p>(NOTE: If the initial physician and the second physician cannot resolve their disagreement quickly, the installation and the affected individual designate a third physician to carry out the review function.)</p> <p>Verify that the installation acts in a manner that is consistent with the recommendation of the third physician.</p> <p>(NOTE: This requirement does not apply if the installation and the individual reach an agreement that is consistent with the recommendations of at least one of the other two physicians.)</p> <p>(NOTE: The installation and an affected individual or designated representative may agree upon the use of any alternate form of physician determination in lieu of the multiple physician review process, so long as the alternative is expeditious and at least as protective of the individual.)</p> <p>Verify that the installation provides a copy of the physician's written medical opinion to the examined individual within 2 weeks after receiving it.</p> <p>Verify that the installation provides the examined individual with a copy of his/her biological monitoring results and an explanation sheet explaining those results within 2 weeks after receiving them.</p> <p>Verify that, within 30 days after a request by an individual, the installation provides him/her with the information that the installation is required to provide the examining physician under 29 CFR 1910.1027(l)(9) (see checklist item CD.120.10).</p>
<p><b>CD.140.4.</b> Installations must report any abnormal condition or disorder caused by occupational exposure to cadmium (29 CFR 1910.1027(l)(16)).</p>	<p>Verify that the installation reports any abnormal condition or disorder caused by occupational exposure to cadmium on the OSHA Form No. 200.</p> <p>(NOTE: This requirement applies in addition to other medical events that must be reported on the OSHA Form No. 200 Chapter (V)(E) of the Reporting Guidelines for Occupational Injuries and Illnesses.)</p>

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<p><b>CD.150 HAZARD COMMUNICATION</b></p> <p><b>CD.150.1.</b> Installations must comply with specific requirements in communications concerning cadmium hazards (29 CFR 1910.1027(m)(1)).</p> <p><b>CD.150.2.</b> Warning signs must be provided and displayed in certain areas (29 CFR 1910.1027(m)(2)(i)).</p> <p><b>CD.150.3.</b> Required warning signs must bear certain information (29 CFR 1910.1027(m)(2)(ii)).</p> <p><b>CD.150.4.</b> Required warning signs must be illuminated, cleaned, and maintained so that the legend is readily visible (29 CFR 1910.1027(m)(2)(iii)).</p> <p><b>CD.150.5.</b> Labels are required on certain containers (29 CFR 1910.1027(m)(3)(i) and (m)(3)(ii)).</p>	<p>Verify that the installation complies with the provisions of 29 CFR 1910.1200 (see the checklist items in Chapter 16: Hazard Communication, excluding those items that are based solely on AFOSH STDs).</p> <p>Verify that warning signs are provided and displayed in regulated areas.</p> <p>Verify that warning signs are posted at all approaches to regulated areas so personnel may read the signs and take necessary protective steps before entering the area.</p> <p>Verify that all required warning signs bear the following information:</p> <p style="text-align: center;">DANGER          CADMIUM          CANCER HAZARD          CAN CAUSE LUNG AND KIDNEY DISEASE          AUTHORIZED PERSONNEL ONLY          RESPIRATORS REQUIRED IN THIS AREA.</p> <p>Verify that required warning signs are illuminated, cleaned, and maintained as necessary so that the legend is readily visible.</p> <p>Verify that shipping and storage containers which contain cadmium, cadmium compounds, or cadmium contaminated clothing, equipment, waste, scrap, or debris bear warning labels.</p> <p>Verify that the warning labels contain at least the following information:</p> <p style="text-align: center;">DANGER          CONTAINS CADMIUM          CANCER HAZARD          AVOID CREATING DUST          CAN CAUSE LUNG AND KIDNEY DISEASE.</p>

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<b>CD.150.6.</b> Installed cadmium products must, if feasible, have a visible label or other indication that cadmium is present (29 CFR 1910.1027 (m)(3)(iii)).	Verify that, if feasible, installed cadmium products have a visible label or other indication that cadmium is present.
<b>CD.150.7.</b> Installations must institute a training program for all personnel who are potentially exposed to cadmium (29 CFR 1910.1027(m)(4)(i)).	<p>Verify that the installation has instituted a training program for all personnel who are potentially exposed to cadmium.</p> <p>Verify that the installation ensures that personnel participate in the training program.</p> <p>Verify that the installation maintains a record of the contents of its training program.</p>
<b>CD.150.8.</b> Training must be provided on a specific schedule (29 CFR 1910.1027(m)(4)(ii)).	<p>Verify that training is provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium.</p> <p>Verify that training is provided at least annually after the initial training.</p>
<b>CD.150.9.</b> The training program is subject to specific requirements as to contents (29 CFR 1910.1027(m)(4)(iii) and (m)(4)(iv)(B)).	<p>Verify that the training is understandable to personnel.</p> <p>Verify that the installation ensures that each individual is informed of the following:</p> <ul style="list-style-type: none"> <li>- the health hazards associated with cadmium exposure, with special attention to the information included in Appendix A of 29 CFR 1910.1027</li> <li>- the quantity, location, manner of use, release, and storage of cadmium in the workplace and the specific nature of operations that could result in exposure to cadmium, especially exposures above the OEL</li> <li>- the engineering controls and work practices associated with the individual's job assignment</li> <li>- the measures personnel can take to protect themselves from exposure to cadmium, including modification of such habits as smoking and personal hygiene, and specific procedures the installation has implemented to protect personnel from exposure to cadmium such as appropriate work practices, emergency procedures, and the provision of personal protective equipment</li> <li>- the purpose, proper selection, fitting, proper use, and limitations of respirators and protective clothing</li> <li>- the purpose and a description of the installation's medical surveillance program</li> <li>- the contents of 29 CFR 1910.1027 and its appendices</li> <li>- the individual's right of access to records under 29 CFR 1910.1020(e) and 1910.1020(g).</li> </ul>

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<p><b>CD.150.10.</b> Installations must make a copy of 29 CFR 1910.1027 and its appendices readily available without cost to all affected personnel and must provide a copy if requested (29 CFR 1910.1027(m)(4)(iv)(A)).</p>	<p>Verify that the installation makes a copy of 29 CFR 1910.1027 and its appendices readily available, without cost, to all affected personnel.</p> <p>Verify that the installation provides a copy if requested.</p>



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<p><b>CD.160</b>  <b>RECORDKEEPING</b></p> <p><b>CD.160.1.</b> Installations must establish and keep an accurate record of all air monitoring for cadmium in the workplace (29 CFR 1910.1027(n)(1)).</p> <p><b>CD.160.2.</b> Objective data used to establish an exemption from the requirement for initial monitoring must be kept for at least 30 yr (29 CFR 1910.1027(n)(2)(ii)).</p> <p><b>CD.160.3.</b> Installations must establish and maintain an accurate record for each individual who participates in medical surveillance (29 CFR 1910.1027(n)(3)).</p>	<p>Verify that the installation establishes and keeps an accurate record of all air monitoring for cadmium in the workplace.</p> <p>Verify that the record contains at least the following information:</p> <ul style="list-style-type: none"> <li>- the monitoring date, duration, and results in terms of an 8-h TWA of each sample taken</li> <li>- the name, social security number, and job classification of the individuals monitored and of all other personnel whose exposures the monitoring is intended to represent</li> <li>- a description of the sampling and analytical methods used and evidence of their accuracy</li> <li>- the type of respiratory protection device, if any, worn by the monitored individual</li> <li>- a notation of any other conditions that might have affected the monitoring results.</li> </ul> <p>Verify that this record is kept for at least 30 yr.</p> <p>Verify that the installation establishes and maintains a record of the objective data used to establish an exemption from the requirement for initial monitoring.</p> <p>Verify that this record is kept for at least 30 yr.</p> <p>Verify that the installation establishes and maintains an accurate record for each individual covered by medical surveillance under 29 CFR 1910.1027(l)(1)(i) (see checklist item CD.100.1).</p> <p>Verify that the record includes at least the following information about the personnel covered:</p> <ul style="list-style-type: none"> <li>- name, social security number, description of duties</li> <li>- a copy of the physician's written opinions and an explanation sheet for biological monitoring results</li> <li>- a copy of the medical history, and the results of any physical examination and all test results that must be provided under 29 CFR 1910.1027, including biological tests, x-rays, pulmonary function tests, etc., or that have been obtained to further evaluate any condition that might be related to cadmium exposure</li> </ul>

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<p><b>CD.160.4.</b> Installations must certify that personnel have been trained (29 CFR 1910.1027(n)(4)).</p>	<ul style="list-style-type: none"> <li>- the individual's medical symptoms that might be related to exposure to cadmium</li> <li>- a copy of the information provided to the physician as required by 29 CFR 1910.1027(l)(9)(ii) through 1910.1027(l)(9)(v) (see checklist item CD.120.10).</li> </ul> <p>Verify that this record is maintained for the duration of employment plus 30 yr.</p> <p>Verify that the installation certifies that its personnel have been trained by preparing a certification record that includes the following information:</p> <ul style="list-style-type: none"> <li>- the identity of the person trained</li> <li>- the signature of the individual who conducted the training</li> <li>- the date the training was completed.</li> </ul> <p>Verify that the certification records are prepared at the completion of the training.</p> <p>Verify that the certification records are maintained on file for 1 yr beyond the date of the training of the given individual.</p>
<p><b>CD.160.5.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.1027(n)(6)).</p>	<p>Verify that, in the event of personnel reassignment, all monitoring and medical removal records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that casefiles be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>

**COMPLIANCE CATEGORY:**  
**EOH: CADMIUM**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CD.170</b>  <b>OBSERVATION OF MONITORING</b></p> <p><b>CD.170.1.</b> Installations must provide the opportunity to observe exposure monitoring to certain parties (29 CFR 1910.1027(o)(1)).</p> <p><b>CD.170.2.</b> Observation procedures must meet specific requirements (29 CFR 1910.1027(o)(2)).</p>	<p>Verify that the installation provides affected personnel or their designated representatives an opportunity to observe any monitoring of personnel exposure to cadmium.</p> <p>Determine whether observation of the monitoring of personnel exposure to cadmium requires entry into areas where the use of protective clothing or equipment is required.</p> <p>Verify that the installation:</p> <ul style="list-style-type: none"> <li>- provides observers with protective clothing or equipment</li> <li>- ensures that observers use the equipment</li> <li>- requires observers to meet all other applicable safety and health procedures.</li> </ul>



## Appendix 27-1

### Respiratory Protection for Cadmium (29 CFR 1910.1027, Table 2)

Airborne Concentration of Cadmium or Condition of Use	Required Respirator Type <sup>(a)</sup>
25 x OEL or less	A powered air purifying respirator (PAPR) with a loose-fitting hood or helmet equipped with a HEPA <sup>(b)</sup> filter, or a supplied-air respirator with a loose-fitting hood or helmet facepiece operated in the continuous flow mode.
50 x OEL or less	A full facepiece air-purifying respirator with a HEPA filter, or a PAPR with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode.
250 x OEL or less	A PAPR with a tight-fitting full facepiece equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting full facepiece operated in the continuous flow mode.
1000 x OEL or less	A supplied-air respirator with half mask or full facepiece operated in the pressure demand or other positive pressure mode.
>1000 x or unknown concentrations	A self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full facepiece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode.
Fire fighting	A self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

<sup>a</sup> Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 x the TWA OEL ( $10 \times 5 \mu\text{g}/\text{m}^3 = 50 \text{ mg}/\text{m}^3$ ). A full facepiece respirator is required when eye irritation is experienced.

<sup>b</sup> HEPA - high efficiency particulate air.

(NOTE: Qualitative or quantitative fit testing is required.)



## **CHAPTER 28**

### **BENZENE**

## CHAPTER 28

### EOH: BENZENE

#### ECAMP-ANG

September 1997

#### Applicability

OSHA regulations would exempt certain activities (such as some forms of bulk storage and also distribution) from the requirements of this chapter. The DOD, however, does not exempt such activities.

#### Compliance Definitions

- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1028(b)).
- *Action Level (AL)* - an airborne concentration of benzene of 0.5 ppm calculated as an 8-h TWA (29 CFR 1910.1028(b)).
- *Authorized Person* - any person entering such an area as a designated representative of personnel for the purpose of exercising the right to observe monitoring and measuring procedures (29 CFR 1910.1028(b)).
- *Benzene* - ( $C_6H_6$ ) (Chemical Abstract Service (CAS) Registry No. 71-43-2) liquefied or gaseous benzene. It includes benzene contained in liquid mixtures and the benzene vapors released by these liquids. It does not include trace amounts of unreacted benzene contained in solid materials (29 CFR 1910.1028(b)).
- *Bulk Wholesale Storage Facility* - a bulk terminal or bulk plant where fuel is stored prior to its delivery to wholesale customers (29 CFR 1910.1028(b)).
- *Container* - any barrel, bottle, can, cylinder, drum, reaction vessel, storage tank, or the like; it does not include piping systems (29 CFR 1910.1028(b)).
- *Day* - any part of a calendar day (29 CFR 1910.1028(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1028(b)).
- *Emergency* - any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an unexpected significant release of benzene (29 CFR 1910.1028(b)).
- *End of Service Life Indicator/End-of-Useful-Life Indicator* - a system that warns the user of the approach of the end of adequate protection provided by the respirator. It is normally used when an air-purifying respirator is worn for protection [against] a gas or vapor with poor warning properties (AFOSH STD 48-1, Attachment 1, Section C).
- *Escape-Only Respirator* - intended only for use during emergency egress from an atmosphere that is or may become immediately dangerous to life or health (IDLH) (AFOSH STD 48-1, Attachment 1, Section C).

- *Filtering Face Piece Device* - a respirator that has a face piece made entirely of filtering or adsorbing material. These respirators do not have changeable filters or cartridges. The device does not have an inhalation valve, and it may or may not have an exhalation valve (AFOSH STD 48-1, Attachment 1, Section C).
- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8-h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).
- *Poor Warning Properties* - such properties exist for those substances that do not exhibit detectable and persistent odor, taste, or irritation effects at concentrations at or below the occupational exposure limit (AFOSH STD 48-1, Attachment 1, Section C).
- *Qualitative Fit-Test* - a pass/fail fit-test that relies on the subject's sensory response to detect the challenge agent (AFOSH STD 48-1, Attachment 1, Section C).
- *Quantitative Fit-Test* - a fit-test that uses an instrument to measure the challenge agent inside and outside the respirator (AFOSH STD 48-1, Attachment 1, Section C).
- *Regulated Area* - any area where airborne concentrations of benzene exceed or can reasonably be expected to exceed, the permissible exposure limits, either the 8-h time-weighted average exposure of 1 ppm or the short-term exposure limit (STEL) of 5 ppm for 15 min (29 CFR 1910.1028(b)).
- *Vapor Control System* - any equipment used for containing the total vapors displaced during the loading of gasoline, motor fuel, or other fuel tank trucks, and the displacing of these vapors through a vapor processing system or balancing the vapor with the storage tank. This equipment also includes systems containing the vapors displaced from the storage tank during the unloading of the tank truck that balance the vapors back to the tank truck (29 CFR 1910.1028(b)).

**EOH: BENZENE**

**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Occupational Exposure Limits	BZ.10.1	28-5
Regulated Areas	BZ.20.1 through BZ.20.3	28-7
Exposure Monitoring	BZ.30.1 through BZ.30.6	28-9
Methods of Compliance	BZ.40.1 through BZ.40.5	28-11
Respiratory Protection	BZ.50.1 through BZ.50.7	28-13
Protective Work Clothing and Equipment	BZ.60.1	28-15
Medical Surveillance	BZ.70.1 through BZ.70.12	28-17
Medical Removal	BZ.80.1 through BZ.80.7	28-21
Hazard Communications	BZ.90.1 through BZ.90.4	28-23
Recordkeeping	BZ.100.1 through BZ.100.6	28-25
Observation of Monitoring	BZ.110.1 and BZ.110.2	28-27

Appendix 28-1, *Respiratory Protection for Benzene*

28-29



**COMPLIANCE CATEGORY:**  
**EOH: BENZENE**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.10</b>  <b>OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>BZ.10.1.</b> Installations must ensure that personnel are not exposed to an airborne concentration of benzene above specific limits (29 CFR 1910.1028(c)).</p>	<p>(NOTE: AFOSH STD 48-8. <i>Controlling Exposures to Hazardous Substances</i>, requires the use of the most recent threshold limit values published in <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> by the American Conference of Governmental Industrial Hygienists. The guidance provided by that publication (that is updated annually) is to be followed if no separate AFOSH STD has been issued for a particular substance.)</p> <p>Verify that no personnel are exposed to airborne concentrations of benzene in excess of 1 ppm as an 8-h TWA.</p> <p>Verify that no personnel are exposed to an airborne concentration of benzene in excess of 5 ppm as averaged over any 15-min period.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.20</b>  <b>REGULATED AREAS</b></p> <p><b>BZ.20.1.</b> Installations must establish a regulated area under specific circumstances (29 CFR 1910.1028(d)(1)).</p> <p><b>BZ.20.2.</b> Access to regulated areas must be limited to authorized persons (29 CFR 1910.1028(d)(2)).</p> <p><b>BZ.20.3.</b> Regulated areas must be demarcated from the rest of the workplace in any manner that minimizes the number of personnel exposed to benzene within the regulated area (29 CFR 1910.1028(d)(2)).</p>	<p>Verify that a regulated area is established wherever the airborne concentration of benzene exceeds or can reasonably be expected to exceed the OELs.</p> <p>Verify that the installation limits access to regulated areas to authorized persons.</p> <p>Verify that regulated areas are demarcated from the rest of the workplace in some manner that minimizes the number of personnel exposed to benzene within the regulated area.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.30</b>  <b>EXPOSURE MONITORING</b></p> <p><b>BZ.30.1.</b> Installations that have workplaces and work operations where personnel are exposed to benzene must monitor those workplaces and operations (29 CFR 1910.1028(e)(2)(i) and (e)(4)(i)).</p> <p><b>BZ.30.2.</b> The monitoring for airborne concentration of benzene must be repeated at certain intervals in specific circumstances (29 CFR 1910.1028(e)(3)(i) through (e)(3)(iii) and (e)(4)(ii)).</p> <p><b>BZ.30.3.</b> Monitoring for the STEL must be repeated as necessary to evaluate exposures of personnel who are subject to short term exposures (29 CFR 1910.1028(e)(3) (iv)).</p>	<p>Verify that the installation monitors each workplace where there is personnel exposure to benzene to determine accurately the airborne concentration of benzene to which personnel are exposed.</p> <p>Verify that work operations are also monitored for accurate determination of airborne concentration of benzene.</p> <p>Verify that this monitoring is completed within 30 days after the introduction of benzene into the workplace.</p> <p>(NOTE: If initial monitoring reveals that personnel exposure is below the action level the installation may discontinue the monitoring for that individual, unless required by 29 CFR 1910.1028(e)(5) (see checklist item BZ.30.4).)</p> <p>Determine the degree of exposure revealed by required monitoring.</p> <p>Verify that, if the required monitoring reveals that personnel exposure for an individual is at or above the action level but at or below the TWA, the installation repeats the monitoring for each such individual at least every year.</p> <p>Verify that, if the monitoring reveals personnel exposure above the TWA, the installation repeats such monitoring for each such individual at least every 6 mo.</p> <p>(NOTE: The installation may alter the monitoring schedule from every 6 mo to annually for any individual for whom two consecutive measurements taken at least 7 days apart indicate that the personnel exposure has decreased to the TWA or below, but is at or above the action level.)</p> <p>(NOTE: If the periodic monitoring reveals that personnel exposures, as indicated by at least two consecutive measurements taken at least 7 days apart, are below the action level, the installation may discontinue the monitoring for that individual, unless required by 29 CFR 1910.1028(e)(5) (see checklist item BZ.30.4).)</p> <p>Verify that monitoring for the STEL is repeated as necessary to evaluate exposures of personnel who are subject to short term exposures.</p>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>EOH: BENZENE</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.30.4.</b> Additional exposure monitoring must be instituted in certain circumstances (29 CFR 1910.1028(e)(5)(i)).</p>	<p>Verify that the installation institutes additional monitoring when:</p> <ul style="list-style-type: none"> <li>- there has been a change in the production, process, control equipment, personnel, or work practices that may result in new or additional exposures to benzene</li> <li>- the installation has any reason to suspect a change that may result in new or additional exposures</li> <li>- spills, leaks, ruptures or other breakdowns occur that may lead to personnel exposure.</li> </ul> <p>(NOTE: In the latter case, monitoring (by either area or personal sampling) takes place after the cleanup of the spill or repair of the leak, rupture, or other breakdown to ensure that exposures have returned to the level that existed prior to the incident.)</p>
<p><b>BZ.30.5.</b> All monitoring for airborne concentration of benzene must meet specific standards as to accuracy (29 CFR 1910.1028(e)(6)).</p>	<p>Verify that monitoring is accurate, to a confidence level of 95 percent, to within plus or minus 25 percent for airborne concentrations of benzene.</p>
<p><b>BZ.30.6.</b> Affected personnel must be notified in writing of monitoring results (29 CFR 1910.1028(e)(7)).</p>	<p>Verify that the installation notifies each affected individual in writing of the results of any monitoring carried out in conformity with this protocol.</p> <p>(NOTE: Personnel may be notified either individually or by the posting of results in an appropriate location that is accessible to affected individuals.)</p> <p>Verify that such notification is given within 15 working days after the receipt of the results of any monitoring performed in conformity with this protocol.</p> <p>Verify that, whenever the OELs are exceeded, the written notification contains the corrective action being taken by the installation to reduce personnel exposure to or below the OEL.</p> <p>(NOTE: The notification may instead refer to a document available to the personnel that states the corrective actions to be taken.)</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.40</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>BZ.40.1.</b> Installations must institute engineering controls and work practices to reduce and maintain personnel exposure to benzene at or below the permissible exposure limits (29 CFR 1910.1028(f)(1)(i)).</p> <p><b>BZ.40.2.</b> Certain steps must be taken in the event that engineering controls and work practices are not sufficient to reduce personnel exposure to or below the OELs (29 CFR 1910.1028(f)(1)(ii)).</p> <p><b>BZ.40.3.</b> Certain steps must be taken in the event that benzene is used in a workplace less than a total of 30 days/yr (29 CFR 1910.1028(f)(1)(iii)).</p> <p><b>BZ.40.4.</b> Installations must develop and implement a written compliance program under certain circumstances (29 CFR 1910.1028(f)(2)(i)).</p> <p><b>BZ.40.5.</b> Written compliance programs must meet specific standards (29 CFR 1910.1028(f)(2)(ii) and (f)(2)(iii)).</p>	<p>Verify that the installation institutes engineering controls and work practices that reduce and maintain personnel exposure to benzene at or below the OELs.</p> <p>(NOTE: This requirement does not apply to the extent that the installation can establish that these controls are not feasible, nor does it apply where the provisions of paragraph 29 CFR 1910.1028(f)(1)(iii) or 1910.1028(g)(1) apply (see checklist items BZ.40.3 and BZ.50.1).)</p> <p>Verify that the installation uses engineering controls and work practices to reduce personnel exposure to the lowest levels achievable by these controls.</p> <p>Verify that the installation supplements the engineering controls and work practices by the use of respiratory protection that meets the requirements of paragraph 29 CFR 1910.1028(g) (see the checklist items in BZ.50).</p> <p>Determine whether the installation can document that benzene is used in a workplace less than a total of 30 days/yr.</p> <p>Verify that the installation uses engineering controls, work practice controls, or respiratory protection, or any combination of these controls, to reduce personnel exposure to benzene to or below the OELs.</p> <p>Verify that the installation uses engineering and work practice controls, if feasible, to reduce exposure to or below 10 ppm as an 8-h TWA.</p> <p>Verify that, when any exposures exceed the OEL, the installation establishes and implements a written program to reduce personnel exposure to or below the OEL.</p> <p>Verify that this reduction in exposure is accomplished primarily by means of engineering and work practice controls.</p> <p>Verify that the written program includes a schedule for development and implementation of the engineering and work practice controls.</p> <p>Verify that these plans are reviewed and revised as appropriate, based on the most recent exposure monitoring data, to reflect the current status of the program.</p>

<b>COMPLIANCE CATEGORY:</b> <b>EOH: BENZENE</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
	Verify that the written compliance program is furnished upon request for examination and copying to the Assistant Secretary, the Director, affected individuals, and designated personnel representatives.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.50</b>  <b>RESPIRATORY PROTECTION</b></p> <p><b>BZ.50.1.</b> Respirators are required in certain circumstances (29 CFR 1910.1028(g)(1)).</p> <p><b>BZ.50.2.</b> Installations must provide respirators and ensure they are used when required (29 CFR 1910.1028(g)(1)).</p> <p><b>BZ.50.3.</b> Respirators must be selected in accordance with specific criteria (29 CFR 1910.1028(g)(2)).</p>	<p>(NOTE: The requirements of this portion of the protocol do apply to the following, as per the note at the start of the section on benzene:</p> <ul style="list-style-type: none"> <li>- loading and unloading operations at bulk wholesale storage facilities that use vapor control systems for all loading and unloading operations</li> <li>- the storage, transportation, distribution or sale of benzene or liquid mixtures containing more than 0.1 percent benzene in intact containers or in transportation pipelines while sealed in such a manner as to contain benzene vapors or liquid.)</li> </ul> <p>Verify that respirators are used in the following circumstances:</p> <ul style="list-style-type: none"> <li>- during the time period necessary to install or implement feasible engineering and work practice controls</li> <li>- in work operations for which the installation establishes that compliance with the TWA or STEL through the use of engineering and work practice controls is not feasible</li> <li>- in work situations where feasible engineering and work practice controls are not yet sufficient or are not required under 29 CFR 1910.1028(f)(1)(iii) (see checklist item BZ.40.3) to reduce exposure to or below the OELs</li> <li>- in emergencies.</li> </ul> <p>(NOTE: Examples of instances where the installation establishes that compliance with the TWA or STEL through the use of engineering and work practice controls is not feasible include some maintenance and repair activities, vessel cleaning, or other operations where engineering and work practice controls are infeasible because exposures are intermittent in nature and limited in duration.)</p> <p>Verify that the installation provides respirators and ensures they are used when required.</p> <p>Verify that, where respirators are required or allowed, appropriate respirators are selected in accordance with Appendix 28-1.</p> <p>Verify that the installation selects respirators from among those jointly approved by MSHA and NIOSH.</p> <p>Verify that negative pressure respirators have filter elements approved by MSHA/NIOSH for organic vapors or benzene.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BZ.50.4.</b> Installations must institute a respiratory protection program that is in compliance with specific Federal requirements (29 CFR 1910.1028(g)(3)).</p> <p><b>BZ.50.5.</b> The air-purifying element in air-purifying respirators must be replaced in accordance with specific requirements (29 CFR 1910.1028 (g)(4)(i) and (g)(4)(ii)).</p> <p><b>BZ.50.6.</b> Personnel who wear respirators must be allowed to carry out certain activities connected with their use (29 CFR 1910.1028(g)(4)(iii)).</p> <p><b>BZ.50.7.</b> Installations must meet certain requirements with regard to fit testing for negative pressure respirators (29 CFR 1910.1028(g)(5)).</p>	<p>Verify that any individual who cannot wear a negative pressure respirator is given the option of wearing a respirator with less breathing resistance such as a powered air-purifying respirator or supplied air respirator.</p> <p>Verify that the respirators selected are provided at no cost to personnel.</p> <p>Verify that the installation's respiratory protection program meets the standards of 29 CFR 1910.134(b) and 1910.134(d) through 1910.134(f) (see checklist items PE.30.4, PE.30.5, PE.30.7, PE.30.9, PE.40.2, PE.60.1 through 3, PE.60.7, PE.70.1, PE.70.2, PE.70.4 through PE.70.7, PE.80.1, PE.90.2, PE.100.1 through 100.6, and PE.100.9 through PE.100.12).</p> <p>Verify that, where air-purifying respirators are used, the installation replaces the air purifying element at the expiration of service life or at the beginning of each shift in which they will be used, whichever comes first.</p> <p>(NOTE: If an air purifying element with an end-of-useful-life indicator for benzene approved by MSHA/NIOSH becomes available, the element may be used until such time as the indicator shows no further useful life.)</p> <p>Verify that personnel who wear respirators are permitted to leave the regulated area to wash their faces and respirator facepieces as necessary.</p> <p>Verify that personnel who wear respirators are permitted to change the filter elements of air-purifying respirators whenever they detect a change in breathing resistance or chemical vapor breakthrough.</p> <p>Verify that the installation performs, and certifies the results of, either quantitative or qualitative fit tests at the time of initial fitting and at least annually thereafter for each individual wearing a negative pressure respirator.</p> <p>Verify that the fit test is used to select a respirator facepiece that exhibits minimum leakage and provides the protection required in Appendix 28-1.</p> <p>Verify that the installation provides and ensures that personnel wear a respirator demonstrated by the fit test to provide the required protection.</p> <p>Verify that the installation follows the test protocols outlined in Appendix E of 29 CFR 1910.1028 for whichever type of fit testing the installation chooses.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>BZ.60</b> <b>PROTECTIVE CLOTHING AND EQUIPMENT</b>  <b>BZ.60.1.</b> Installations must meet certain requirements with regard to personal protective equipment (29 CFR 1910.1028(h)).	<p>Verify that personal protective clothing and equipment are worn where appropriate to prevent eye contact and limit dermal exposure to liquid benzene.</p> <p>Verify that protective clothing and equipment are provided by the installation at no cost to personnel.</p> <p>Verify that the installation ensures the use of protective clothing and equipment where appropriate.</p> <p>Verify that eye and face protection meet the requirements of 29 CFR 1910.133 (see the checklist items in PE.20).</p>



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<p><b>BZ.70</b>  <b>MEDICAL SURVEIL-</b>  <b>LANCE</b></p> <p><b>BZ.70.1.</b> Installations must make a medical surveillance program available to certain personnel (29 CFR 1910.1028 (i)(1)(i)).</p> <p><b>BZ.70.2.</b> Installations must meet specific requirements with regard to medical surveillance (29 CFR 1910.1028(i)(1)(ii) through (i)(1)(iv)).</p> <p><b>BZ.70.3.</b> Prior to initial assignment certain personnel must be given medical examinations that address specific concerns (29 CFR 1910.1028 (i)(2)(i)).</p>	<p>Verify that the installation makes a medical surveillance program available to the following personnel:</p> <ul style="list-style-type: none"> <li>- personnel who are or may be exposed to benzene at or above the action level 30 or more days per year</li> <li>- personnel who are or may be exposed to benzene at or above the OELs 10 or more days per year.</li> </ul> <p>Verify that all medical examinations and procedures are performed by or under the supervision of a licensed physician.</p> <p>Verify that all laboratory tests are conducted by an accredited laboratory.</p> <p>Verify that persons other than licensed physicians who administer required pulmonary function testing have completed a training course in spirometry sponsored by an appropriate governmental, academic, or professional institution.</p> <p>Verify that all examinations and procedures are provided without cost to the individual and at a reasonable time and place.</p> <p>Verify that personnel who meet the requirements of 29 CFR 1910.1028(i)(1)(i) (see checklist item BZ.70.1) receive medical examinations prior to initial assignment.</p> <p>Verify that the medical examination includes the following elements:</p> <ul style="list-style-type: none"> <li>- a detailed occupational history that includes: <ul style="list-style-type: none"> <li>- past work exposure to benzene or any other hematological toxins</li> <li>- a family history of blood dyscrasia including hematological neoplasms</li> <li>- a history of blood dyscrasia including genetic hemoglobin abnormalities, bleeding abnormalities, abnormal function of formed blood elements</li> <li>- a history of renal or liver dysfunction</li> <li>- a history of medicinal drugs routinely taken</li> <li>- a history of previous exposure to ionizing radiation</li> <li>- exposure to marrow toxins outside of the current work situation</li> </ul> </li> <li>- a complete physical examination</li> <li>- a complete blood count including: <ul style="list-style-type: none"> <li>- a leukocyte count with differential</li> <li>- a quantitative thrombocyte count</li> <li>- hematocrit, hemoglobin, and erythrocyte count</li> </ul> </li> </ul>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>EOH: BENZENE</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
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<p><b>BZ.70.4.</b> Annual medical examinations that address specific concerns must be provided to certain personnel (29 CFR 1910.1028(i)(3)).</p>	<ul style="list-style-type: none"> <li>- erythrocyte indices (mean corpuscular value (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC))</li> <li>- additional tests as necessary in the opinion of the examining physician, based on alterations to the components of the blood or other signs that may be related to benzene exposure.</li> </ul> <p>Verify that the results of laboratory tests related to the individual's blood are reviewed by the examining physician.</p> <p>Verify that, for all personnel required to wear respirators for at least 30 days/yr. the physical examination pays special attention to the cardiopulmonary system and includes a pulmonary function test.</p> <p>Verify that personnel who meet the requirements of 29 CFR 1910.1028(i)(1)(i) (see checklist item BZ.70.1) receive annual medical examinations.</p> <p>Verify that the periodic examination includes at least the following elements:</p> <ul style="list-style-type: none"> <li>- a brief history regarding any new exposure to potential marrow toxins, changes in medicinal drug use, and the appearance of physical signs relating to blood disorders</li> <li>- a complete blood count including: <ul style="list-style-type: none"> <li>- a leukocyte count with differential</li> <li>- quantitative thrombocyte count</li> <li>- hemoglobin, hematocrit, and erythrocyte count</li> <li>- erythrocyte indices (MCV, MCH, MCHC)</li> <li>- appropriate additional tests as necessary, in the opinion of the examining physician, based on alterations in the components of the blood or other signs that may be related to benzene exposure.</li> </ul> </li> </ul>
<p><b>BZ.70.5.</b> Emergency medical examinations must be provided under certain circumstances (29 CFR 1910.1028(i)(4)(i)).</p>	<p>Verify that, if an individual is exposed to benzene in an emergency situation, the installation ensures that he/she provides a urine sample at the end of the work shift and has a urinary phenol test performed on the sample within 72 h.</p> <p>(NOTE: If the result of the urinary phenol test is below 75 mg phenol/L of urine, no further testing is required.)</p> <p>(NOTE: This requirement applies to the following, as per the note at the start of the section on benzene:</p> <ul style="list-style-type: none"> <li>- loading and unloading operations at bulk wholesale storage facilities that use vapor control systems for all loading and unloading operations</li> <li>- the storage, transportation, distribution or sale of benzene or liquid mixtures containing more than 0.1 percent benzene in intact containers or in transportation pipelines while sealed in such a manner as to contain benzene vapors or liquid.)</li> </ul>

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<p><b>BZ.70.6.</b> Installations must take specific steps, based on the outcome of the emergency medical examination (29 CFR 1910.1028(i)(4)(ii) through (i)(4)(iv)).</p>	<p>Verify that, if the result of the urinary phenol test is equal to or greater than 75 mg phenol/L of urine, the installation provides the affected individual with a complete blood count including an erythrocyte count, leukocyte count with differential and thrombocyte count at monthly intervals for a duration of 3 mo following the emergency exposure.</p> <p>(NOTE: This requirement applies to the following, as per the note at the start of the section on benzene:</p> <ul style="list-style-type: none"> <li>- loading and unloading operations at bulk wholesale storage facilities that use vapor control systems for all loading and unloading operations</li> <li>- the storage, transportation, distribution or sale of benzene or liquid mixtures containing more than 0.1 percent benzene in intact containers or in transportation pipelines while sealed in such a manner as to contain benzene vapors or liquid.)</li> </ul> <p>Verify that, if any of the conditions specified in 29 CFR 1910.1028(i)(5)(i) exists (see checklist item BZ.70.7), the further requirements of 29 CFR 1910.1028(i)(5) are met.</p> <p>Verify that the installation provides the affected personnel with periodic examinations if so directed by the physician.</p>
<p><b>BZ.70.7.</b> Blood counts must be repeated within 2 weeks under certain circumstances (29 CFR 1910.1028(i)(5)(i)).</p>	<p>Verify that blood counts are repeated within 2 weeks when the results of the complete blood count required for the initial and periodic examinations indicate that any of the following abnormal conditions exist:</p> <ul style="list-style-type: none"> <li>- the hemoglobin level or the hematocrit falls below the normal limit (outside the 95 percent confidence interval (CI)) as determined by the laboratory for the particular geographic area and/or these indices show a persistent downward trend from the individual's pre-exposure norms; provided these findings cannot be explained by other medical reasons</li> <li>- the thrombocyte (platelet) count varies more than 20 percent below the individual's most recent values or falls outside the normal limit (95 percent CI) as determined by the laboratory</li> <li>- the leukocyte count is below 4000/mm<sup>3</sup> or there is an abnormal differential count.</li> </ul>
<p><b>BZ.70.8.</b> Referrals for further examination must be provided under certain circumstances (29 CFR 1910.1028(i)(5)(ii)).</p>	<p>Verify that, if the abnormality persists, the examining physician refers the affected individual to a hematologist or an internist for further evaluation.</p> <p>(NOTE: This requirement does not apply if the physician has good reason to believe that such a referral is unnecessary; Appendix C to 29 CFR 1910.1028 contains a list of examples of conditions where a referral may be unnecessary.)</p>

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<p><b>BZ.70.9.</b> Installations must provide the hematologist or internist with specific information (29 CFR 1910.1028 (i)(5) (iii)).</p>	<p>Verify that the installation provides the hematologist or internist with the information required by 29 CFR 1910.1028(i)(6) (see checklist item BZ.70.11).</p>
<p><b>BZ.70.10.</b> The evaluation by the hematologist or internist must include a determination as to the need for additional tests (29 CFR 1910.1028 (i)(5)(iv)).</p>	<p>Verify that the evaluation by the hematologist or internist includes a determination as to the need for additional tests.</p> <p>Verify that the installation ensures that such tests are provided.</p>
<p><b>BZ.70.11.</b> The examining physician must be provided with specific information (29 CFR 1910.1028(i)(6)).</p>	<p>Verify that the examining physician is provided with the following:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1028 and its appendices</li> <li>- a description of the affected individual's duties as they relate to his/her exposure</li> <li>- the individual's actual or representative exposure level</li> <li>- a description of any personal protective equipment used or to be used</li> <li>- information from previous employment-related medical examinations of the affected individual that is not otherwise available to the examining physician.</li> </ul>
<p><b>BZ.70.12.</b> For each examination, the installation must obtain and provide the affected individual with a copy of the examining physician's written opinion within 15 days of the examination (29 CFR 1910.1028 (i)(7)(i)).</p>	<p>Verify that, for each examination, the installation obtains a copy of the examining physician's written opinion.</p> <p>Verify that, for each examination, the installation provides a copy of the written opinion to the affected individual within 15 days of the examination.</p> <p>(NOTE: The contents of the written opinion is strictly limited. The examining physician should be aware of the limitations listed in 29 CFR 1910.1028(i)(7)(i) and (i)(7)(ii).)</p>

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<p><b>BZ.80</b>  <b>MEDICAL REMOVAL</b></p> <p><b>BZ.80.1.</b> Personnel must be removed under certain circumstances from areas where exposure to benzene is above the action level (29 CFR 1910.1028(i)(8)(i)).</p> <p><b>BZ.80.2.</b> Physicians must make the decision to remove an individual from a work area or allow his/her return to a work area in accordance with specific requirements (29 CFR 1910.1028(i)(8)(ii)).</p> <p><b>BZ.80.3.</b> A follow-up examination must be provided to personnel who have been removed for medical reasons (29 CFR 1910.1028(i)(8)(iii)).</p> <p><b>BZ.80.4.</b> Physicians must make the decision as to whether removal is permanent in accordance with specific requirements (29 CFR 1910.1028(i)(8)(iii)).</p> <p><b>BZ.80.5.</b> Installations must meet specific requirements in the event of a temporary removal based on a physician's recommendation (29 CFR 1910.1028(i)(8)(iv)).</p>	<p>Determine whether a physician has made a referral to a hematologist/internist as required by 29 CFR 1910.1028(i)(5)(ii) (see checklist item BZ.70.8).</p> <p>Verify that the affected individual is removed from areas where exposures may exceed the action level.</p> <p>Verify that the affected individual remains away from the work area until such time as the physician makes a determination under 29 CFR 1910.1028(i)(8)(ii) (see checklist item BZ.80.2).</p> <p>Verify that the physician makes the decision to remove an individual from or to allow him/her to return to the work area in consultation with the hematologist/internist.</p> <p>Verify that the decision is communicated in writing to the installation and to the affected individual.</p> <p>Verify that, in the case of removal, the physician states the required probable duration of removal from occupational exposure to benzene above the action level and the requirements for future medical examinations to review the decision.</p> <p>Verify that individuals removed under the provisions of 29 CFR 1910.1028(i)(8)(ii) (see checklist item BZ.80.2) are provided with a follow-up examination.</p> <p>Verify that the physician, in consultation with the hematologist/internist, makes a decision within 6 mo of the date the individual was removed as to whether he/she is to be returned to the usual job or whether he/she should be removed permanently.</p> <p>Verify that the individual is transferred to a comparable job for which he/she is qualified (or can be trained for in a short period) and where benzene exposures are as low as possible but in no event higher than the action level.</p>

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<p><b>BZ.80.6.</b> Installations must provide medical removal protection benefits to individuals who have been permanently re-moved from exposure to benzene because of hematological findings (29 CFR 1910.1028(i)(8) (v)).</p> <p><b>BZ.80.7.</b> Installations must provide 6 mo of medical removal protection benefits immediately following each occasion an individual is removed from exposure to benzene because of hematological findings (29 CFR 1910.1028(i)(9)(i) and (i)(9)(ii)).</p>	<p>Verify that, if there is no such job available, the installation provides medical removal protection benefits until such a job becomes available or for 6 mo, whichever comes first.</p> <p>Verify that the installation maintains the individual's current wage rate, seniority, and other benefits.</p> <p>Verify that the individual is given the opportunity to transfer to another position that is currently available or later becomes available for which he/she is qualified (or for which he/she can be trained in a short period) and where benzene exposures are as low as possible but in no event higher than the action level.</p> <p>Verify that the installation ensures that such an individual suffers no reduction in current wage rate, seniority, or other benefits as a result of the transfer.</p> <p>Verify that 6 mo of medical removal protection benefits are provided immediately following each occasion an individual is removed from exposure to benzene because of hematological findings.</p> <p>(NOTE: This requirement does not apply if the individual has been transferred to a comparable job where benzene exposures are below the action level.)</p> <p>(NOTE: The requirement that the installation provide medical removal protection benefits means that the installation must maintain the current wage rate, seniority, and other benefits of an individual as though he/she had not been removed.)</p> <p>(NOTE: The obligation to provide medical removal protection benefits to removed personnel is reduced to the extent that the individual receives compensation for earnings lost during the period of removal either from a publicly or installation-funded compensation program, or from employment with another installation made possible by virtue of the individual's removal.)</p>

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<p><b>BZ.90</b>  <b>HAZARD COMMUNICATION</b></p> <p><b>BZ.90.1.</b> Installations must post signs that meet specific requirements at the entrances to regulated areas (29 CFR 1910.1028(j)(1)(i)).</p> <p><b>BZ.90.2.</b> Benzene containers must bear labels or other appropriate forms of warning (29 CFR 1910.1028(j)(1)(ii)).</p> <p><b>BZ.90.3.</b> Installations must obtain or develop MSDSs and make them accessible to personnel (29 CFR 1910.1028(j)(2)(i)).</p> <p><b>BZ.90.4.</b> Installations must have a benzene-related training program that meets specific requirements (29 CFR 1910.1028(j)(3)).</p>	<p>Verify that signs are posted at the entrances to regulated areas.</p> <p>Verify that the signs bear the following legend:</p> <p style="text-align: center;">DANGER  BENZENE  CANCER HAZARD  FLAMMABLE--NO SMOKING  AUTHORIZED PERSONNEL ONLY  RESPIRATOR REQUIRED.</p> <p>Verify that labels or other appropriate forms of warning are provided for containers of benzene within the workplace.</p> <p>(NOTE: Pipes do not require labels.)</p> <p>Verify that the labels meet the requirements of 29 CFR 1910.1200(f) (see the check-list items in HC.40) and in addition include the following legend:</p> <p style="text-align: center;">DANGER  CONTAINS BENZENE  CANCER HAZARD.</p> <p>Verify that the installation obtains or develops MSDSs that address benzene.</p> <p>Verify that the MSDSs meet the requirements of 29 CFR 1910.1200 (see check-list items HC.50.1, HC.50.3, and HC.50.4).</p> <p>Verify that the MSDSs are accessible to installation personnel involved with benzene.</p> <p>Verify that the installation provides personnel with information and training at the time of their initial assignment to a work area where benzene is present.</p> <p>Verify that, if exposures are above the action level, personnel are provided with information and training at least annually thereafter.</p>

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	<p>Verify that the training program meets the requirements of 29 CFR 1910.1200(h)(1) and (h)(2) (see checklist items HC.60.1 and HC.60.2) and includes specific information on benzene for each category of information included in that regulation.</p> <p>Verify that, in addition to the information required under 29 CFR 1910.1200 (see checklist items HC.60.1 and HC.60.2), the installation:</p> <ul style="list-style-type: none"> <li>- provides personnel with an explanation of the contents of 29 CFR 1910.1028, including Appendices A and B</li> <li>- indicates to personnel where the standard is available</li> <li>- describes the medical surveillance program required by 29 CFR 1910.1028(i)</li> <li>- explains the information contained in 29 CFR 1910.1028, Appendix C.</li> </ul>

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<p><b>BZ.100 RECORDKEEPING</b></p> <p><b>BZ.100.1.</b> Installations must establish and maintain records of exposure monitoring in accordance with specific requirements (29 CFR 1910.1028(k)(1)).</p> <p><b>BZ.100.2.</b> Installations must establish and maintain records of medical surveillance in accordance with specific requirements (29 CFR 1910.1028(k)(2)).</p> <p><b>BZ.100.3.</b> Installations must ensure that all required records are made available upon request to the Assistant Secretary and the Director for</p>	<p>Verify that the installation establishes and maintains an accurate record of all measurements required by 29 CFR 1910.1028(e) (see the checklist items in BZ.30), in accordance with the requirements of 29 CFR 1910.1020.</p> <p>Verify that this record includes:</p> <ul style="list-style-type: none"> <li>- the dates, number, duration, and results of each of the samples taken, including a description of the procedure used to determine representative personnel exposures</li> <li>- a description of the sampling and analytical methods used</li> <li>- a description of the type of respiratory protective devices worn, if any</li> <li>- the name, social security number, job classification, and exposure levels of the individual monitored and all other personnel whose exposure the measurement is intended to represent.</li> </ul> <p>Verify that the installation maintains this record for at least 30 yr. in accordance with 29 CFR 1910.1020.</p> <p>Verify that the installation establishes and maintains an accurate record for each individual subject to medical surveillance required by 29 CFR 1910.1028(i) (see checklist item BZ.70.1), in accordance with 29 CFR 1910.1020.</p> <p>Verify that this record includes:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the individual</li> <li>- the installation's copy of the physician's written opinion on the initial, periodic, and special examinations, including results of medical examinations and all tests, opinions, and recommendations</li> <li>- any of the individual's medical complaints related to benzene exposure</li> <li>- a copy of the information provided to the physician as required by 29 CFR 1910.1028(i)(6)(ii) through (i)(6)(v) (see checklist item BZ.70.11)</li> <li>- a copy of the individual's medical and work history related to exposure to benzene or any other hematologic toxins.</li> </ul> <p>Verify that the installation maintains this record for at least the duration of employment plus 30 yr, in accordance with 29 CFR 1910.1020.</p> <p>Verify that the installation ensures that all records required to be maintained by Section M of this protocol are made available upon request to the Assistant Secretary and the Director for examination and copying.</p>

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<p>examination and copying (29 CFR 1910.1028 k)(3)(i)).</p> <p><b>BZ.100.4.</b> Installations must provide required exposure monitoring records upon request to certain parties (29 CFR 1910.1028(k)(3)(ii)).</p> <p><b>BZ.100.5.</b> Installations must ensure that required medical surveillance records are provided upon request to certain parties (29 CFR 1910.1028(k)(3) (iii)).</p> <p><b>BZ.100.6.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.1028(k)(4)).</p>	<p>Verify that the installation provides exposure monitoring records required by 29 CFR 1910.1028(k) (see checklist items BZ.100.1 and BZ.100.2) upon request for examination and copying to personnel, their representatives, and the Assistant Secretary.</p> <p>Verify that medical records required by 29 CFR 1910.1028(k) (see checklist items BZ.100.1 and BZ.100.2) are provided upon request for examination and copying to the subject individual, to anyone having the specific written consent of the subject individual, and to the Assistant Secretary in accordance with 29 CFR 1910.1020.</p> <p>Verify that, in the event of personnel reassignment, all monitoring and medical removal records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that casefiles be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>

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<p><b>BZ.110</b>  <b>OBSERVATION OF MONITORING</b></p> <p><b>BZ.110.1.</b> Installations must provide the opportunity to observe exposure monitoring to certain parties (29 CFR 1910.1028 (1)(1)).</p> <p><b>BZ.110.2.</b> Observation procedures must meet specific requirements (29 CFR 1910.1028(1)(2)).</p>	<p>Verify that the installation provides affected personnel or their designated representatives with an opportunity to observe the measuring or monitoring of personnel exposure to benzene.</p> <p>Determine whether observation of the measuring or monitoring of personnel exposure to benzene requires entry into areas where the use of protective clothing and equipment or respirators is required.</p> <p>Verify that the installation:</p> <ul style="list-style-type: none"> <li>- provides observers with personal protective clothing and equipment or respirators required to be worn by personnel working in the area</li> <li>- ensures that observers use such clothing and equipment or respirators</li> <li>- requires observers to meet all other applicable safety and health procedures.</li> </ul>



## Appendix 28-1

### Respiratory Protection for Benzene (29 CFR 1910.1028, Table 1)

Airborne Concentration of Benzene or Condition of Use	Respirator Type
Less than or equal to 10 ppm.	Half-mask air-purifying respirator with organic vapor cartridges.
Less than or equal to 50 ppm.	Full facepiece respirator with organic vapor cartridges.
Less than or equal to 100 ppm.	Full facepiece gas mask with chin style canister. <sup>1</sup> Full facepiece powered air-purifying respirator with organic vapor canister. <sup>1</sup>
Less than or equal to 1000 ppm.	Supplied air respirator with full facepiece in positive pressure mode.
Greater than 1000 ppm or unknown concentration.	Self-contained breathing apparatus with full facepiece in positive pressure mode. Full facepiece positive pressure supplied-air respirator with auxiliary self-contained air supply.
Escape	Any organic vapor gas mask, or any self-contained breathing apparatus with full facepiece.
Fire fighting	Full facepiece, self-contained breathing apparatus operated in positive pressure mode.

<sup>1</sup> Canisters must have a minimum service life of 4 h when tested at 150 ppm benzene, at a flow rate of 64 LPM [2.26 cfm], 25 °C [45.9 °F] and 85 percent relative humidity for nonpowered air purifying respirators. The flow rate must be 115 LPM [4.06 cfm] and 170 LPM [6.0 cfm] respectively for tight fitting and loose fitting powered air-purifying respirators.



## **CHAPTER 29**

### **METHYLENE CHLORIDE**

**CHAPTER 29**  
**EOH: METHYLENE CHLORIDE**  
**ECAMP-ANG**

**September 1997**

**Applicability**

This chapter applies to all occupational exposures to Methylene Chloride (MC), CAS Registry Number 75-09-2, in general industry.

This chapter became effective 10 April 1997.

Unless otherwise specified, all requirements of this chapter must be complied with according to the following schedule:

- for employers with fewer than 20 employees, within 1 year after 10 April 1997
- for polyurethane foam manufacturers with 20 to 99 employees, within 270 days after 10 April 1997
- for all other employers, within 180 days after 10 April 1997.

The exposure limits for MC specified in 29 CFR 1910.1000 (1996), Table Z-2, remain in effect until the appropriate compliance date for the exposure limits specified in the above note, or if the exposure limits in 29 CFR 1910.1052 are stayed or vacated.

**Compliance Definitions**

- *Action Level* - a concentration of airborne MC of 12.5 ppm calculated as an 8-hr TWA (29 CFR 1910.1052(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1052(b)).
- *Authorized Person* - any person specifically authorized by the employer and required by work duties to be present in regulated areas, or any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring and measuring procedures under 29 CFR 1910.1052(d), or any other person authorized by the OSH Act or regulations issued under the Act (29 CFR 1910.1052(b)).
- *Director* - the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee (29 CFR 1910.1052(b)).
- *Emergency* - any occurrence, such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which results, or is likely to result in an uncontrolled release of MC. If an incidental release of MC can be controlled by employees such as maintenance personnel at the time of release and in accordance with the leak/spill provisions of this chapter, it is not considered an emergency (29 CFR 1910.1052(b)).
- *Employee Exposure* - exposure to airborne MC which occurs or would occur if the employee were not using respiratory protection (29 CFR 1910.1052(b)).
- *Filtering Face Piece Device* - a respirator that has a face piece made entirely of filtering or adsorbing material. These respirators do not have changeable filters or cartridges. The device does not have an inhalation valve, and it may or may not have an exhalation valve (AFOSH STD 48-1, Attachment 1, Section C).

- *Methylene Chloride (MC)* - an organic compound with chemical formula,  $\text{CH}_2\text{Cl}_2$ . Its Chemical Abstracts Service (CAS) Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole (29 CFR 1910.1052(b)).
- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8-h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).
- *Physician or Other Licensed Health Care Professional* - an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the health care services required by 29 CFR 1910.1052(j) (29 CFR 1910.1052(b)).
- *Regulated Area* - an area, demarcated by the employer, where an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed either the 8-hr TWA OEL or the STEL (29 CFR 1910.1052(b)).
- *Short-Term Exposure Limit (STEL)* - the occupational exposure limit (OEL) for a 15-min sampling period (29 CFR 1910.1052(c)).
- *Symptom* - central nervous system effects such as headaches, disorientation, dizziness, fatigue, and decreased attention span; skin effects such as chapping, erythema, cracked skin, or skin burns; and cardiac effects such as chest pain or shortness of breath (29 CFR 1910.1052(b)).

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Occupational Exposure Limits	MC.10.1	29-5
Exposure Monitoring	MC.20.1 through MC.20.6	29-7
Regulated Areas	MC.30.1 through MC.30.6	29-11
Methods of Compliance	MC.40.1 through MC.40.3	29-13
Respiratory Protection	MC.50.1 through MC.50.7	29-15
Protective Work Clothing and Equipment	MC.60.1 through MC.60.3	29-17
Hygiene Facilities	MC.70.1	29-19
Medical Surveillance	MC.80.1 through MC.80.7	29-21
Hazard Communications	MC.90.1	29-27
Employee Information and Training	MC.100.1 through MC.100.7	29-29
Recordkeeping	MC.110.1 through MC.110.5	29-31
 <b>Appendix 29-1, Six Initial Determination Exposure Scenarios and Their Associated Monitoring Frequencies</b>		29-35
<b>Appendix 29-2, Minimum Requirements for Respiratory Protection for Airborne Methylene Chloride</b>		29-37



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<p><b>MC.10 OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>MC.10.1.</b> Employers must ensure that no employee is exposed to MC in excess of certain limitations (29 CFR 1910.1052(c)).</p>	<p>Verify that no employee is exposed to an airborne concentration of MC in excess of 25 ppm of air as an 8-hr TWA.</p> <p>Verify that no employee is exposed to an airborne concentration of MC in excess of 125 ppm of air as determined over a sampling period of 15 min.</p>



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<p><b>MC.20 EXPOSURE MONITORING</b></p> <p><b>MC.20.1.</b> Each employee's exposure to MC must be determined in accordance with certain requirements (29 CFR 1910.1052(d)(1)).</p>	<p>Verify that, where MC is present in the workplace, the employer determines each employee's exposure by either:</p> <ul style="list-style-type: none"> <li>- taking a personal breathing zone air sample of each employee's exposure</li> <li>- taking personal breathing zone air samples that are representative of each employee's exposure.</li> </ul> <p>(NOTE: The employer may consider personal breathing zone air samples to be representative of employee exposures when they are taken according to the following requirements.)</p> <p>Verify that, for 8-hr TWA OEL representative sampling, the employer takes one or more personal breathing zone air samples for at least one employee in each job classification in a work area during every work shift.</p> <p>Verify that the employee sampled is expected to have the highest MC exposure.</p> <p>Verify that, for STEL representative sampling, the employer takes one or more personal breathing zone air samples which indicate the highest likely 15-min exposures during such operations for at least one employee in each job classification in the work area during every work shift.</p> <p>Verify that the employee sampled is expected to have the highest MC exposure.</p> <p>(NOTE: Personal breathing zone air samples taken during one work shift may be used to represent employee exposures on other workshifts where the employer can document that the tasks performed and conditions in the workplace are similar across shifts.)</p> <p>Verify that the employer ensures that the methods used to perform exposure monitoring produce results that are accurate to a confidence level of 95 percent, and are:</p> <ul style="list-style-type: none"> <li>- accurate to within +/- 25 percent for airborne concentrations of MC above the 8-hr TWA OEL or the STEL</li> <li>- accurate to within +/- 35 percent for airborne concentrations of MC at or above the action level but at or below the 8-hr TWA OEL.</li> </ul>

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<p><b>MC.20.2.</b> Employers whose employees are exposed to MC must per-form initial exposure monitoring (29 CFR 1910.1052(d)(2)).</p>	<p>(NOTE: The following initial monitoring requirements must be complied with according to the following schedule:</p> <ul style="list-style-type: none"> <li>- for employers with fewer than 20 employees, within 300 days after 10 April 1997</li> <li>- for polyurethane foam manufacturers with 20 to 99 employees, within 210 days after 10 April 1997</li> <li>- for all other employers, within 120 days after 10 April 1997.)</li> </ul> <p>Verify that each employer whose employees are exposed to MC performs initial exposure monitoring to determine each affected employee's exposure.</p> <p>(NOTE: This requirement does not apply under any one of the following conditions:</p> <ul style="list-style-type: none"> <li>- where objective data demonstrates that MC cannot be released in the work-place in airborne concentrations at or above the action level or above the STEL</li> <li>- where the employer has performed exposure monitoring within 12 mo prior to 10 April 1997, and that exposure monitoring: <ul style="list-style-type: none"> <li>- meets all other requirements of this chapter</li> <li>- was conducted under conditions substantially equivalent to existing conditions</li> </ul> </li> <li>- where: <ul style="list-style-type: none"> <li>- employees are exposed to MC on fewer than 30 days/yr (e.g., on a construction site) and</li> <li>- the employer has measurements by direct-reading instruments which give immediate results (such as a detector tube) and which provide sufficient information regarding employee exposures to determine what control measures are necessary to reduce exposures to acceptable levels.)</li> </ul> </li> </ul> <p>Verify that, where objective data is used:</p> <ul style="list-style-type: none"> <li>- such data represent the highest MC exposures likely to occur under reasonably foreseeable conditions of processing, use, or handling</li> <li>- the employer documents all of the information required to support an objective data exemption as specified in the recordkeeping requirements of this chapter (see the checklist items in MC.110).</li> </ul>
<p><b>MC.20.3.</b> Periodic monitoring which meets specific requirements must be performed under certain conditions (29 CFR 1910.1052 (d)(3)).</p>	<p>Verify that, where the initial determination shows employee exposures at or above the action level or above the STEL, the employer establishes an exposure monitoring program for periodic monitoring of employee exposure to MC in accordance with Appendix 29-1.</p> <p>(NOTE: The employer may decrease the frequency of exposure monitoring to every 6 mo when at least two consecutive measurements taken at least 7 days apart show exposures to be at or below the 8-hr TWA OEL. The employer may discontinue the periodic 8-hr TWA monitoring for employees where at least two</p>

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<p><b>MC.20.4.</b> Additional monitoring must be performed when a change in workplace conditions indicates that employee exposure may have increased (29 CFR 1910.1052 (d)(4)).</p> <p><b>MC.20.5.</b> Employees must be notified of monitoring results (29 CFR 1910.1052 (d)(5)).</p> <p><b>MC.20.6.</b> Employers must provide affected employees an opportunity to observe monitoring (29 CFR 1910.1052 (d)(6)).</p>	<p>consecutive measurements taken at least 7 days apart are below the action level. The employer may discontinue the periodic STEL monitoring for employees where at least two consecutive measurements taken at least 7 days apart are at or below the STEL.)</p> <p>Verify that the employer performs exposure monitoring when a change in workplace conditions indicates that employee exposure may have increased.</p> <p>(NOTE: Examples of situations that may require additional monitoring include:</p> <ul style="list-style-type: none"> <li>- changes in production, process, control equipment, or work practices</li> <li>- a leak, rupture, or other breakdown.</li> </ul> <p>Verify that, where exposure monitoring is performed due to a spill, leak, rupture or equipment breakdown, the employer cleans-up the MC and performs the appropriate repairs before monitoring.</p> <p>Verify that, within 15 working days after the receipt of the results of any MC monitoring, the employer notifies each affected employee of these results in writing, either individually or by posting of results in an appropriate location that is accessible to affected employees.</p> <p>Verify that, whenever monitoring results indicate that employee exposure is above the 8-hr TWA OEL or the STEL, the employer describes in the written notification the corrective action being taken to reduce employee exposure to or below the 8-hr TWA OEL or STEL and the schedule for completion of this action.</p> <p>Verify that the employer provides affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to MC.</p> <p>Determine whether the observation of the monitoring of employee exposure to MC requires entry into an area where the use of protective clothing or equipment is required.</p> <p>Verify that, in such situations:</p> <ul style="list-style-type: none"> <li>- the employer provides, at no cost to the observer(s), such clothing and equipment</li> <li>- the observer(s) are required to use such clothing and equipment and comply with all other applicable safety and health procedures.</li> </ul>



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<p><b>MC.30</b> <b>REGULATED AREAS</b></p> <p><b>MC.30.1.</b> A regulated area must be established in certain circumstances (29 CFR 1910.1052(e)(1)).</p> <p><b>MC.30.2.</b> Access to regulated areas must be limited (29 CFR 1910.1052(e)(2)).</p> <p><b>MC.30.3.</b> Employers must supply respirators for use in the regulated area (29 CFR 1910.1052(e)(3)).</p> <p><b>MC.30.4.</b> Employees must not engage in certain activities within the regulated area (29 CFR 1910.1052(e)(4) and (5)).</p> <p><b>MC.30.5.</b> Regulated areas must be demarcated (29 CFR 1910.1052(e)(6)).</p>	<p>Verify that the employer establishes a regulated area wherever an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed either the 8-hr TWA OEL or the STEL.</p> <p>Verify that the employer limits access to regulated areas to authorized persons.</p> <p>Verify that the employer supplies a respirator to each person who enters a regulated area.</p> <p>Verify that the employer selects the respirator in accordance with the requirements of 29 CFR 1910.1052(g)(3) (see checklist item MC.50.3).</p> <p>Verify that the employer requires each affected employee to use that respirator when-ever MC exposures are likely to exceed the 8-hr TWA OEL or STEL.</p> <p>(NOTE: An employer who has implemented all required feasible engineering, work practice, and administrative controls, and who has established a regulated area where MC exposure can be reliably predicted to exceed the 8-hr TWA OEL or the STEL only on certain days (for example, because of work or process schedule) would need to have affected employees use respirators in that regulated area only on those days.)</p> <p>Verify that employees do not engage in non-work activities, within a regulated area, which may increase dermal or oral MC exposure.</p> <p>Verify that, while employees are wearing respirators, they do not engage in activities which interfere with respirator seal or performance.</p> <p>(NOTE: Such prohibited activities include taking medication, and chewing gum or tobacco.)</p> <p>Verify that the employer demarcates regulated areas from the rest of the workplace in any manner that adequately establishes and alerts employees to the boundaries of the area and minimizes the number of authorized employees exposed to MC within the regulated area.</p>

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<b>MC.30.6.</b> Employers at a multi-employer worksite must communicate certain information regarding restricted areas to all other employers at that worksite (29 CFR 1910.1052(e)(7)).	Verify that an employer at a multi-employer worksite who establishes a regulated area communicates the access restrictions and locations of these areas to all other employers with work operations at that worksite.

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<p><b>MC.40</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>MC.40.1.</b> Employers must institute and maintain engineering and work practice controls (29 CFR 1910.1052(f)(1)).</p> <p><b>MC.40.2.</b> Employers must not implement a schedule of employee rotation as a means of compliance with the OELs (29 CFR 1910.1052(f)(2)).</p> <p><b>MC.40.3.</b> Employers must handle leaks and spills according to certain requirements (29 CFR 1910.1052(f)(3)).</p>	<p>(NOTE: Engineering controls and work practices must be instituted in accordance with the following schedule:</p> <ul style="list-style-type: none"> <li>- for employers with fewer than 20 employees, within 3 years after 10 April 1997</li> <li>- for polyurethane foam manufacturers with 20 to 99 employees, within 2 years after 10 April 1997</li> <li>- for all other employers, within 1 year after 10 April 1997.)</li> </ul> <p>Verify that the employer institutes and maintains the effectiveness of engineering controls and work practices to reduce employee exposure to or below the OELs.</p> <p>(NOTE: This requirement does not apply if the employer can demonstrate that such controls are not feasible.)</p> <p>Verify that, wherever the feasible engineering controls and work practices which can be instituted are not sufficient to reduce employee exposure to or below the 8-hr TWA OEL or STEL, the employer uses them to reduce employee exposure to the lowest levels achievable by these controls and supplements them by the use of respiratory protection that complies with the requirements of this chapter.</p> <p>Verify that the employer does not implement a schedule of employee rotation as a means of compliance with the OELs.</p> <p>Verify that the employer implements procedures to detect leaks of MC in the workplace.</p> <p>Verify that, in work areas where spills may occur, the employer makes provisions to contain any spills and to safely dispose of any MC-contaminated waste materials.</p> <p>Verify that all incidental leaks are repaired by employees who use the appropriate personal protective equipment.</p> <p>Verify that incidental spills are cleaned promptly by employees who use the appropriate personal protective equipment and are trained in proper methods of cleanup.</p>

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	<p>(NOTE: See Appendix A of 29 CFR 1910.1052 for examples of procedures that satisfy this requirement.)</p> <p>(NOTE: Employers may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120(q) (see the checklist items in Chapter 31: Emergency Response).)</p>

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<p><b>MC.50 RESPIRATORY PROTECTION</b></p> <p><b>MC.50.1.</b> Respirators must be provided and used in certain circumstances (29 CFR 1910.1052(g)(1)).</p> <p><b>MC.50.2.</b> Employees must undergo a medical evaluation prior to using respirators in certain situations (29 CFR 1910.1052(g)(2)).</p> <p><b>MC.50.3.</b> Respirators must be selected in accordance with certain requirements (29 CFR 1910.1052(g)(3)).</p> <p><b>MC.50.4.</b> Certain employers must institute a respirator</p>	<p>Verify that respirators are used in the following circumstances:</p> <ul style="list-style-type: none"> <li>- whenever an employee's exposure to MC exceeds or can reasonably be expected to exceed the 8-hr TWA OEL or the STEL (such as where an employee is using MC in a regulated area)</li> <li>- during the time interval necessary to install or implement feasible engineering and work practice controls</li> <li>- in a few work operations, such as some maintenance operations and repair activities, for which the employer demonstrates that engineering and work practice controls are infeasible</li> <li>- where feasible engineering and work practice controls are not sufficient to reduce exposures to or below the OELs</li> <li>- in emergencies.</li> </ul> <p>Verify that the employer provides a respirator at no cost to each affected employee, and ensures that each affected employee uses such respirator where appropriate.</p> <p>Determine whether any employee uses either:</p> <ul style="list-style-type: none"> <li>- a supplied-air respirator in the negative pressure mode</li> <li>- a gas mask with organic vapor canister for emergency escape.</li> </ul> <p>Verify that the employer has a physician or other licensed health care professional ascertain each such employee's ability to use such respiratory protection.</p> <p>Verify that this medical evaluation occurs before an employee uses such a respirator or mask.</p> <p>Verify that the physician or other licensed health care professional provides his or her findings to the affected employee and the employer in a written opinion.</p> <p>Verify that the appropriate atmosphere-supplying respirators, as specified in Appendix 29-2, is selected from those approved by NIOSH.</p> <p>Verify that, when employers elect to provide gas masks with organic vapor canisters for use in emergency escape, the organic vapor canisters bear the approval of NIOSH.</p> <p>Determine whether any employees are required to use respiratory protection.</p>

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<p>program which complies with specific requirements (29 CFR 1910.1052(g)(4)).</p> <p><b>MC.50.5.</b> Employers must permit employees to leave regulated areas in certain circumstances (29 CFR 1910.1052(g)(5)).</p> <p><b>MC.50.6.</b> Cartridges for certain filter respirators must be replaced after emergency use (29 CFR 1910.1052(g)(6)).</p> <p><b>MC.50.7.</b> Fit testing must be performed in accordance with certain requirements (29 CFR 1910.1052(g)(7)).</p>	<p>Verify that the employer institutes a respirator program in accordance with 29 CFR 1910.134 (see the checklist items in PE.30 through PE.120).</p> <p>Verify that the employer permits employees who wear respirators to leave the regulated area in order:</p> <ul style="list-style-type: none"> <li>- to readjust the facepieces to their faces to achieve a proper fit</li> <li>- to wash their faces and respirator facepieces as necessary in order to prevent skin irritation associated with respirator use.</li> </ul> <p>Verify that employers who provide gas masks with organic vapor canisters for the purpose of emergency escape replace those canisters after any emergency use.</p> <p>Verify that replacement occurs before those gas masks are returned to service.</p> <p>Verify that the employer ensures that each respirator issued to the employee is properly fitted and exhibits the least possible facepiece leakage from among the face pieces tested.</p> <p>Verify that the employer performs qualitative or quantitative fit tests at the time of initial fitting and at least annually thereafter for each employee wearing a negative pressure respirator, including those employees for whom emergency escape respirators are provided.</p> <p>(NOTE: The only supplied-air respirators to which this qualitative or quantitative fit testing requirement would apply are self-contained breathing apparatus (SCBA) in negative pressure mode and full facepiece supplied-air respirators operated in negative pressure mode.)</p> <p>(NOTE: The small business compliance guides to be issued by OSHA will contain examples of protocols for qualitative and quantitative fit testing.)</p>

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<p><b>MC.60</b>  <b>PROTECTIVE WORK CLOTHING AND EQUIPMENT</b></p> <p><b>MC.60.1.</b> Employers must, where needed, provide protective clothing and equipment which meets certain requirements (29 CFR 1910.1052(h)(1)).</p> <p><b>MC.60.2.</b> Employers must clean, launder, repair and replace all required protective clothing and equipment as needed (29 CFR 1910.1052 (h)(2)).</p> <p><b>MC.60.3.</b> Employers are responsible for safe disposal of protective clothing and equipment (29 CFR 1910.1052(h)(3)).</p>	<p>Verify that, where needed to prevent MC-induced skin or eye irritation, the employer:</p> <ul style="list-style-type: none"> <li>- provides clean protective clothing and equipment which is resistant to MC</li> <li>- provides such clothing at no cost to the employee</li> <li>- ensures that each affected employee uses it.</li> </ul> <p>Verify that eye and face protection meets the requirements of 29 CFR 1910.133 (see the checklist items in PE.20).</p> <p>Verify that the employer cleans, launders, repairs, and replaces all required protective clothing and equipment as needed to maintain their effectiveness.</p> <p>Verify that the employer disposes of protective clothing and equipment safely.</p> <p>(NOTE: See Appendix A of 29 CFR 1910.1052 for examples of disposal procedures that will satisfy this requirement.)</p>



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<p><b>MC.70</b>  <b>HYGIENE FACILITIES</b></p> <p><b>MC.70.1.</b> Employers must provide specific hygiene facilities in certain situations (29 CFR 1910.1052(i)).</p>	<p>Determine whether it is reasonably foreseeable that employees' skin may contact solutions containing 0.1 percent or greater MC (for example, through splashes, spills, or improper work practices).</p> <p>Verify that the employer:</p> <ul style="list-style-type: none"> <li>- provides conveniently located washing facilities capable of removing the MC</li> <li>- ensures that affected employees use these facilities as needed.</li> </ul> <p>Determine whether it is reasonably foreseeable that an employee's eyes may contact solutions containing 0.1 percent or greater MC (for example through splashes, spills or improper work practices).</p> <p>Verify that the employer:</p> <ul style="list-style-type: none"> <li>- provides appropriate eyewash facilities within the immediate work area for emergency use</li> <li>- ensures that affected employees use those facilities when necessary.</li> </ul>



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<p><b>MC.80 MEDICAL SURVEILLANCE</b></p> <p><b>MC.80.1.</b> Employers must make medical surveillance available for certain employees at no cost to the employees (29 CFR 1910.1052(j)(1) through (3)).</p> <p><b>MC.80.2.</b> Medical surveillance must be performed at certain frequencies (29 CFR 1910.1052(j)(4)).</p>	<p>Verify that the employer makes medical surveillance available to employees who are or may be exposed to MC:</p> <ul style="list-style-type: none"> <li>- at or above the action level on 30 or more days per year, or above the 8-hr TWA OEL or the STEL on 10 or more days per year</li> <li>- above the 8-hr TWA OEL or STEL for any time period where an employee has been identified by a physician or other licensed health care professional as being at risk from cardiac disease or from some other serious MC-related health condition and such employee requests inclusion in the medical surveillance program</li> <li>- during an emergency.</li> </ul> <p>Verify that the employer provides all required medical surveillance at no cost to affected employees, without loss of pay, and at a reasonable time and place.</p> <p>Verify that the employer ensures that all medical surveillance procedures are performed by a physician or other licensed health care professional.</p> <p>Verify that the employer provides initial medical surveillance according to the following schedule or before the time of initial assignment of the employee, whichever is later:</p> <ul style="list-style-type: none"> <li>- for employers with fewer than 20 employees, within 1 year after 10 April 1997</li> <li>- for polyurethane foam manufacturers with 20 to 99 employees, within 270 days after 10 April 1997</li> <li>- for all other employers, within 180 days after 10 April 1997.</li> </ul> <p>(NOTE: The employer need not provide the initial surveillance if medical records show that an affected employee has been provided with medical surveillance that complies with this chapter within 12 months before 10 April 1997.)</p> <p>Verify that the employer updates the medical and work history for each affected employee annually.</p> <p>Verify that the employer provides periodic physical examinations, including appropriate laboratory surveillance, as follows:</p> <ul style="list-style-type: none"> <li>- for employees 45 years of age or older, within 12 mo of the initial surveillance or any subsequent medical surveillance</li> </ul>

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<p><b>MC.80.3.</b> The medical surveillance must include specific items which comply with certain requirements (29 CFR 1910.1052(j)(5)).</p>	<ul style="list-style-type: none"> <li>- for employees younger than 45 years of age, within 36 mo of the initial surveillance or any subsequent medical surveillance.</li> </ul> <p>Verify that, when an employee leaves the employer's workplace, or is reassigned to an area where exposure to MC is consistently at or below the action level and STEL, medical surveillance is made available if six months or more have elapsed since the last medical surveillance.</p> <p>Verify that the employer provides additional medical surveillance at frequencies other than those listed above when recommended in the written medical opinion required by 29 CFR 1910.1052(j)(9) (see checklist item MC.80.7).</p> <p>(NOTE: For example, the physician or other licensed health care professional may determine that an examination is warranted in less than 36 mo for employees younger than 45 yr of age based upon evaluation of the results of the annual medical and work history.)</p> <p>Verify that the comprehensive medical and work history emphasizes:</p> <ul style="list-style-type: none"> <li>- neurological symptoms</li> <li>- skin conditions</li> <li>- history of hematologic or liver disease</li> <li>- signs or symptoms suggestive of heart disease (angina, coronary artery disease)</li> <li>- risk factors for cardiac disease</li> <li>- MC exposures</li> <li>- work practices and personal protective equipment used during such exposures.</li> </ul> <p>(NOTE: See Appendix B of 29 CFR 1910.1052 for an example of a medical and work history format that would satisfy this requirement.)</p> <p>Verify that, where physical examinations are provided as required above, the physician or other licensed health care professional pays particular attention to:</p> <ul style="list-style-type: none"> <li>- the lungs</li> <li>- the cardiovascular system (including blood pressure and pulse)</li> <li>- the liver</li> <li>- the nervous system</li> <li>- the skin.</li> </ul> <p>Verify that the physician or other licensed health care professional determines the extent and nature of the physical examination based on the health status of the employee and analysis of the medical and work history.</p>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>EOH: METHYLENE CHLORIDE</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
<p><b>REGULATORY REQUIREMENTS:</b></p>	<p><b>REVIEWER CHECKS:</b>  <b>September 1997</b></p>
<p><b>MC.80.4.</b> Emergency medical surveillance must contain specific items which comply with certain requirements (29 CFR 1910.1052 (j)(6)).</p>	<p>Verify that the physician or other licensed health care professional determines the extent of any required laboratory surveillance based on the employee's observed health status and the medical and work history.</p> <p>(NOTE: See Appendix B of 29 CFR 1910.1052 for information regarding medical tests.)</p> <p>(NOTE: Laboratory surveillance may include before- and after-shift:</p> <ul style="list-style-type: none"> <li>- carboxyhemoglobin determinations</li> <li>- resting ECG</li> <li>- hematocrit</li> <li>- liver function tests</li> <li>- cholesterol levels.)</li> </ul> <p>Verify that the medical surveillance also includes any other information or reports the physician or other licensed health care professional determines are necessary to assess the employee's health in relation to MC exposure.</p> <p>Verify that the employer ensures that medical surveillance is made available when an employee has been exposed to MC in emergency situations.</p> <p>Verify that emergency medical surveillance includes, at a minimum:</p> <ul style="list-style-type: none"> <li>- appropriate emergency treatment and decontamination of the exposed employee</li> <li>- comprehensive physical examination with special emphasis on the nervous system, cardiovascular system, lungs, liver and skin, including blood pressure and pulse</li> <li>- updated medical and work history, as appropriate for the medical condition of the employee</li> <li>- laboratory surveillance, as indicated by the employee's health status.</li> </ul> <p>(NOTE: See Appendix B of 29 CFR 1910.1052 for examples of tests which may be appropriate for laboratory surveillance.)</p>
<p><b>MC.80.5.</b> Additional examinations and referrals must be provided when determined to be necessary (29 CFR 1910.1052(j)(7)).</p>	<p>Verify that, when the physician or other licensed health care professional determines it is necessary:</p> <ul style="list-style-type: none"> <li>- the scope of the medical examination is expanded</li> <li>- the appropriate additional medical surveillance, such as referrals for consultation or examination, is provided.</li> </ul>

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<p><b>MC.80.6.</b> Certain information must be provided to the physician or other licensed health care professional (29 CFR 1910.1052(j)(8)).</p>	<p>Verify that the employer provides the following information to a physician or other licensed health care professional who is involved in the diagnosis of MC-induced health effects:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1052 including its applicable appendices</li> <li>- a description of the affected employee's past, current, and anticipated future duties as they relate to the employee's MC exposure</li> <li>- the employee's former or current exposure levels or, for employees not yet occupationally exposed to MC, the employee's anticipated exposure levels and the frequency and exposure levels anticipated to be associated with emergencies</li> <li>- a description of any personal protective equipment, such as respirators, used or to be used</li> <li>- information from previous employment-related medical surveillance of the affected employee which is not otherwise available to the physician or other licensed health care professional.</li> </ul>
<p><b>MC.80.7.</b> Written medical opinions that contain certain information must be provided (29 CFR 1910.1052(j)(9)).</p>	<p>Verify that, for each required physical examination, the employer ensures that the physician or other licensed health care professional provides to the employer and to the affected employee a written opinion regarding the results of that examination.</p> <p>Verify that the written opinion is provided within 15 days of completion of the evaluation of medical and laboratory findings, but not more than 30 days after the examination.</p> <p>Verify that the written medical opinion is limited to the following information:</p> <ul style="list-style-type: none"> <li>- the physician's or other licensed health care professional's opinion concerning whether the employee has any detected medical condition(s) which would place the employee's health at increased risk of material impairment from exposure to MC</li> <li>- any recommended limitations upon the employee's exposure to MC or upon the employee's use of protective clothing or equipment and respirators</li> <li>- a statement that the employee has been informed of the following by the physician or other licensed health care professional: <ul style="list-style-type: none"> <li>- that MC is a potential occupational carcinogen</li> <li>- the risk factors for heart disease</li> <li>- the potential for exacerbation of underlying heart disease by exposure to MC through its metabolism to carbon monoxide</li> </ul> </li> <li>- a statement that the employee has been informed by the physician or other licensed health care professional of the results of the medical examination and any medical conditions resulting from MC exposure which require further explanation or treatment.</li> </ul>

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	<p>Verify that the physician or other licensed health care professional is instructed not to reveal to the employer, either orally or in the written opinion, any specific records, findings, and diagnoses that have no bearing on occupational exposure to MC.</p> <p>(NOTE: The written medical opinion may also include information and opinions generated to comply with other OSHA health standards.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>MC.90 HAZARD COMMUNICATION</b></p> <p><b>MC.90.1.</b> Employers must communicate certain hazards associated with MC on labels and in MSDSs (29 CFR 1910.1052(k)).</p>	<p>Verify that the employer communicates the following hazards associated with MC on labels and in MSDSs in accordance with the requirements of the Hazard Communication Standard, 29 CFR 1910.1200 (see the checklist items in Part I, Chapter 16: Hazard Communication):</p> <ul style="list-style-type: none"> <li>- cancer</li> <li>- cardiac effects (including elevation of carboxyhemoglobin)</li> <li>- central nervous system effects</li> <li>- liver effects</li> <li>- skin and eye irritation.</li> </ul>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>MC.100 EMPLOYEE INFORMATION AND TRAINING</b></p> <p><b>MC.100.1.</b> Employers must provide information and training for each affected employee prior to or at the time of initial assignment to a job involving potential exposure to MC (29 CFR 1910.1052(l)(1)).</p> <p><b>MC.100.2.</b> The information and training must be presented in a manner that is understandable to the employees (29 CFR 1910.1052 (l)(2)).</p> <p><b>MC.100.3.</b> Employers must communicate certain additional information to affected employees (29 CFR 1910.1052(l)(3)).</p> <p><b>MC.100.4.</b> Employees must be trained in accordance with certain requirements (29 CFR 1910.1052(l)(4)).</p>	<p>Verify that the employer provides information and training for each affected employee prior to or at the time of initial assignment to a job involving potential exposure to MC.</p> <p>Verify that the employer ensures that information and training is presented in a manner that is understandable to the employees.</p> <p>(NOTE: The information required in this checklist item is in addition to the information required under the Hazard Communication Standard at 29 CFR 1910.1200 (see the checklist items in Part I, Chapter 16: Hazard Communication).)</p> <p>Verify that the employer informs each affected employee of the requirements of 29 CFR 1910.1052 and information available in its appendices, as well as how to access or obtain a copy of it in the workplace.</p> <p>Verify that, wherever an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed the action level, the employer informs each affected employee of the following:</p> <ul style="list-style-type: none"> <li>- the quantity, location, manner of use, release, and storage of MC</li> <li>- the specific operations in the workplace that could result in exposure to MC, particularly noting where exposures may be above the 8-hr TWA OEL or STEL.</li> </ul> <p>Verify that the employer trains each affected employee as required under the Hazard Communication standard at 29 CFR 1910.1200 (see the checklist items in Chapter 16).</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>MC.100.5.</b> Employees must be retrained as necessary (29 CFR 1910.1052(l)(5) and (6)).</p> <p><b>MC.100.6.</b> Employers at multi-employer worksites must notify the other employers at the site of the use of MC (29 CFR 1910.1052(l)(7)).</p> <p><b>MC.100.7.</b> Certain information must be provided to OSHA or NIOSH upon request (29 CFR 1910.1052(l)(8)).</p>	<p>Verify that the employer retrain each affected employee as necessary to ensure that each employee exposed above the action level or the STEL maintains the requisite understanding of the principles of safe use and handling of MC in the workplace.</p> <p>Verify that the employer updates the training as necessary to ensure that each affected employee has the requisite proficiency whenever both of the following occur:</p> <ul style="list-style-type: none"> <li>- there are workplace changes, such as modifications of tasks or procedures or the institution of new tasks or procedures, which increase employee exposure</li> <li>- where such exposures exceed or can reasonably be expected to exceed the action level.</li> </ul> <p>Verify that an employer whose employees are exposed to MC at a multi-employer worksite notifies the other employers with work operations at that site in accordance with the requirements of the Hazard Communication Standard, 29 CFR 1910.1200 (see the checklist items in Chapter 16).</p> <p>Verify that the employer provides to the Assistant Secretary or the Director, upon request, all available materials relating to employee information and training.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>MC.110</b>  <b>RECORDKEEPING</b></p> <p><b>MC.110.1.</b> Certain employers must establish and maintain specific objective data (29 CFR 1910.1052(m)(1)).</p> <p><b>MC.110.2.</b> Employers must establish and maintain records of exposure measurements (29 CFR 1910.1052(m)(2)).</p>	<p>Determine whether the employer seeks to demonstrate that initial monitoring is unnecessary through reasonable reliance on objective data showing that any materials in the workplace containing MC will not release MC at levels which exceed the action level or the STEL under foreseeable conditions of exposure.</p> <p>Verify that the employer establishes and maintains an accurate record of the objective data relied upon in support of such an exemption.</p> <p>Verify that this record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the MC-containing material in question</li> <li>- the source of the objective data</li> <li>- the testing protocol, results of testing, and/or analysis of the material for the release of MC</li> <li>- a description of the operation exempted under 29 CFR 1910.1052(d)(2)(i) (see checklist item MC.20.2) and how the data support the exemption</li> <li>- other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.</li> </ul> <p>Verify that the employer maintains this record for the duration of the employer's reliance upon such objective data.</p> <p>Verify that the employer establishes and keeps an accurate record of all required measurements taken to monitor employee exposure to MC.</p> <p>Verify that, where the employer has 20 or more employees, this record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the date of measurement for each sample taken</li> <li>- the operation involving exposure to MC which is being monitored</li> <li>- sampling and analytical methods used and evidence of their accuracy</li> <li>- number, duration, and results of samples taken</li> <li>- type of personal protective equipment, such as respiratory protective devices, worn, if any</li> <li>- name, social security number, job classification, and exposure of all of the employees represented by monitoring, indicating which employees were actually monitored.</li> </ul> <p>Verify that, where the employer has fewer than 20 employees, the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the date of measurement for each sample taken</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>MC.110.3.</b> Employers must establish and maintain records of medical surveillance (29 CFR 1910.1052(m)(3)).</p> <p><b>MC.110.4.</b> Records must be made available to certain parties in accordance with specific requirements (29 CFR 1910.1052(m)(4)).</p> <p><b>MC.110.5.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.1052(m)(5) and 29 CFR 1910.1020(h)).</p>	<ul style="list-style-type: none"> <li>- number, duration, and results of samples taken</li> <li>- name, social security number, job classification, and exposure of all of the employees represented by monitoring, indicating which employees were actually monitored.</li> </ul> <p>Verify that the employer maintains this record for at least 30 yr.</p> <p>Verify that the employer establishes and maintains an accurate record for each employee subject to required medical surveillance.</p> <p>Verify that the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the name, social security number, and description of the duties of the employee</li> <li>- written medical opinions</li> <li>- any employee medical conditions related to exposure to MC.</li> </ul> <p>Verify that the employer maintains this record for the duration of employment plus 30 yr.</p> <p>Verify that, upon written request, the employer makes all required records available to the Assistant Secretary and the Director for examination and copying in accordance with 29 CFR 1910.1020.</p> <p>(NOTE: All required MC-related records may be kept in the most administratively convenient form (e.g., electronic or computer records would satisfy this requirement).)</p> <p>Verify that, upon request, the employer makes any required employee exposure and objective data records available for examination and copying by affected employees, former employees, and designated representatives in accordance with 29 CFR 1910.1020.</p> <p>Verify that, upon request, the employer makes required employee medical records available for examination and copying by the subject employee and by anyone having the specific written consent of the subject employee in accordance with 29 CFR 1910.1020.</p> <p>Verify that, in the event of personnel reassignment, all monitoring and medical removal records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p>

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	<p>(NOTE: The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>



## Appendix 29-1

### Six Initial Determination Exposure Scenarios and Their Associated Monitoring Frequencies (29 CFR 1910.1052, Table 1)

Exposure scenario	Required monitoring activity
Below the action level and at or below the STEL	No 8-hr TWA or STEL monitoring required
Below the action level and above the STEL	No 8-hr TWA monitoring required; monitor STEL exposures every 3 mo
At or above the action level, at or below the TWA, and at or below the STEL	Monitor 8-hr TWA exposures every 6 mo
At or above the action level, at or below the TWA, and above the STEL	Monitor 8-hr TWA exposures every 6 mo and monitor STEL exposures every 3 mo
Above the TWA and at or below the STEL	Monitor 8-hr TWA exposures every 3 mo
Above the TWA and above the STEL	Monitor 8-hr TWA exposures and STEL exposures every 3 mo



## Appendix 29-2

### Minimum Requirements for Respiratory Protection for Airborne Methylene Chloride (29 CFR 1910.1052, Table 2)

Methylene chloride airborne concentration (ppm) or condition of use	Minimum respirator required <sup>1</sup>
Up to 625 ppm (25 X OEL)	(1) Continuous flow supplied-air respirator, hood or helmet
Up to 1250 ppm (50 X 8-hr TWA OEL)	(1) Full facepiece supplied-air respirator operated in negative pressure (demand) mode
	(2) Full facepiece self-contained breathing apparatus (SCBA) operated in negative pressure (demand) mode
Up to 5000 ppm (200 X 8-hr TWA OEL)	(1) Continuous flow supplied-air respirator, full facepiece
	(2) Pressure demand supplied-air respirator, full facepiece
	(3) Positive pressure full facepiece SCBA
Unknown concentration, or above 5000 ppm (Greater than 200 X 8-hr TWA OEL)	(1) Positive pressure full facepiece SCBA
	(2) Full facepiece pressure demand supplied-air respirator with an auxiliary self-contained air supply
Fire fighting	(1) Positive pressure full facepiece SCBA
Emergency escape	(1) Any continuous flow or pressure demand SCBA
	(2) Gas mask with organic vapor canister

<sup>1</sup>Respirators assigned for higher airborne concentrations may be used at lower concentrations.



## **CHAPTER 30**

### **BLOODBORNE PATHOGENS**

## CHAPTER 30

### EOH: BLOODBORNE PATHOGENS

#### ECAMP-ANG

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#### Compliance Definitions

- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1910.1030(b)).
- *Blood* - human blood, human blood components, and products made from human blood (29 CFR 1910.1030(b)).
- *Bloodborne Pathogens* - pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV) (29 CFR 1910.1030(b)).
- *Clinical Laboratory* - a workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials (29 CFR 1910.1030(b)).
- *Contaminated* - the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface (29 CFR 1910.1030(b)).
- *Contaminated Laundry* - laundry that has been soiled with blood or other potentially infectious materials or may contain sharps (29 CFR 1910.1030(b)).
- *Contaminated Sharps* - any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires (29 CFR 1910.1030(b)).
- *Decontamination* - the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal (29 CFR 1910.1030(b)).
- *Engineering Controls* - controls (e.g., sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace (29 CFR 1910.1030(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1910.1030(b)).
- *Exposure Incident* - a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an individual's duties (29 CFR 1910.1030(b)).
- *Handwashing Facilities* - a facility providing an adequate supply of running potable water, soap, and single use towels or hot air drying machines (29 CFR 1910.1030(b)).
- *HBV* - hepatitis B virus (29 CFR 1910.1030(b)).
- *HIV* - human immunodeficiency virus (29 CFR 1910.1030(b)).

- *Licensed Healthcare Professional* - a person whose legally permitted scope of practice allows him or her to independently perform the activities required of those who do hepatitis B vaccination and post-exposure evaluation and follow-up (29 CFR 1910.1030(b)).
- *Occupational Exposure* - reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an individual's duties (29 CFR 1910.1030(b)).
- *Other Potentially Infectious Materials* -
  1. The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
  2. Any unfixed tissue or organ (other than intact skin) from a human (living or dead).
  3. HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions, and blood, organs, or other tissues from experimental animals infected with HIV or HBV (29 CFR 1910.1030(b)).
- *Parenteral* - piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions (29 CFR 1910.1030(b)).
- *Personal Protective Equipment (PPE)* - specialized clothing, or equipment worn by an individual for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment (29 CFR 1910.1030(b)).
- *Production Facility* - a facility engaged in industrial-scale, large-volume, or high concentration production of HIV or HBV (29 CFR 1910.1030(b)).
- *Properly Labeled and/or Color-Coded* - labeled and/or color-coded in accordance with the requirements of 29 CFR 1910.1030(g)(1)(i) (see checklist items BP.40.1 and BP.40.2).
- *Regulated Waste* - liquid or semi-liquid blood or other potentially infectious materials, contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed, items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps, and pathological and microbiological wastes containing blood or other potentially infectious materials (29 CFR 1910.1030(b)).
- *Research Laboratory* - a laboratory producing or using research-laboratory-scale amounts of HIV or HBV. Research laboratories may produce high concentrations of HIV or HBV but not in the volume found in production facilities (29 CFR 1910.1030(b)).
- *Source Individual* - any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the individual. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components (29 CFR 1910.1030(b)).
- *Sterilize* - the use of a physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores (29 CFR 1910.1030(b)).
- *Universal Precautions* - the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores (29 CFR 1910.1030(b)).

- *Work Practice Controls* - controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., for bloodborne pathogens, prohibiting recapping of needles by a two-handed technique) (29 CFR 1910.1030(b)).



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**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Exposure Control Plan	BP.10.1 through BP.10.4	30-7
Methods of Compliance	BP.20.1 through BP.20.32	30-9
Hepatitis B Vaccinations and Post-exposure Evaluation Follow-Up	BP.30.1 through BP.30.5	30-19
Hazard Communication	BP.40.1 through BP.40.5	30-23
Recordkeeping	BP.50.1 through BP.50.4	30-25



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<p><b>BP.10 EXPOSURE CONTROL PLANS</b></p> <p><b>BP.10.1.</b> Installations where occupational exposure is possible must pre-prepare an exposure determination that meets specific requirements (29 CFR 1910.1030(c)(2)(i) and (c)(2)(ii)).</p> <p><b>BP.10.2.</b> Installations where occupational exposure is possible must establish a written exposure control plan designed to eliminate or minimize personnel exposure (29 CFR 1910.1030(c)(1)(i)).</p> <p><b>BP.10.3.</b> The exposure control plan must meet certain requirements (29 CFR 1910.1030(c)(1)(ii) and (c)(1)(iv)).</p>	<p>Determine whether occupational exposure is possible at the installation.</p> <p>Verify that an exposure determination has been carried out at the installation.</p> <p>Verify that the exposure determination includes the following information:</p> <ul style="list-style-type: none"> <li>- a list of all job classifications in which all personnel in those job classifications have occupational exposure</li> <li>- a list of job classifications in which some personnel have occupational exposure</li> <li>- a list of all tasks and procedures or groups of closely related tasks and procedures in which occupational exposure occurs and that are performed by personnel in the job classifications listed immediately above.</li> </ul> <p>(NOTE: This exposure determination is made without regard to the use of personal protective equipment.)</p> <p>Verify that the installation has a written exposure control plan.</p> <p>Verify that the exposure control plan contains at least the following elements:</p> <ul style="list-style-type: none"> <li>- the installation's exposure determination</li> <li>- the schedule and method of implementation for <ul style="list-style-type: none"> <li>- methods of compliance</li> <li>- communication of hazards to personnel</li> <li>- recordkeeping</li> </ul> </li> <li>- the procedure for the evaluation of circumstances surrounding exposure incidents.</li> </ul> <p>Verify that the exposure control plan is reviewed and updated at least annually and whenever necessary to reflect new or modified tasks and procedures that affect occupational exposure and to reflect new or revised personnel positions with occupational exposure.</p>

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<b>BP.10.4.</b> The exposure control plan must be accessible to personnel (29 CFR 1910.1030(c)(1) (iii)).	Verify that the exposure control plan is accessible to installation personnel.

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<p><b>BP.20</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>BP.20.1.</b> Installations must observe universal precautions to prevent contact with blood or other potentially infectious materials (29 CFR 1910.1030(d)(1)).</p> <p><b>BP.20.2.</b> Installations must use engineering and work practice controls to eliminate or minimize exposure of personnel (29 CFR 1910.1030(d)(2) (i)).</p> <p><b>BP.20.3.</b> Personal protective equipment must be used where occupational exposure remains after the institution of engineering and work practice controls (29 CFR 1910.1030 (d)(2)(i)).</p> <p><b>BP.20.4.</b> Installations must examine and maintain or replace engineering controls on a regular schedule to ensure their effectiveness (29 CFR 1910.1030(d)(2)(ii)).</p> <p><b>BP.20.5.</b> Installations must provide handwashing facilities that are readily accessible to personnel (29 CFR 1910.1030(d)(2)(iii)).</p> <p><b>BP.20.6.</b> Installations must meet specific requirements if it is not feasible to provide hand-washing facilities (29 CFR 1910.1030(d)(2) (iv)).</p>	<p>Verify that the installation observes universal precautions.</p> <p>(NOTE: Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids should be considered potentially infectious materials.)</p> <p>Verify that the installation uses engineering and work practice controls.</p> <p>Verify that, in the event occupational exposure remains after the institution of engineering controls, personal protective equipment is also used.</p> <p>Verify that the installation evaluates and maintains or replaces engineering controls on a regular schedule.</p> <p>Verify that the installation provides readily accessible handwashing facilities.</p> <p>Verify that, when provision of handwashing facilities is not feasible, the installation provides either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes.</p> <p>Verify that, when antiseptic hand cleansers or towelettes are used, personnel</p>

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<p><b>BP.20.7.</b> Personnel must wash their hands and/or other skin areas in specific circumstances (29 CFR 1910.103(d)(2)(v) and (d)(2)(vi)).</p> <p><b>BP.20.8.</b> Contaminated needles and other contaminated sharps must not be bent, recapped, or removed (29 CFR 1910.1030(d)(2)(vii)).</p> <p><b>BP.20.9.</b> Shearing or breaking of contaminated needles is prohibited (29 CFR 1910.1030(d)(2)(vii)).</p> <p><b>BP.20.10.</b> Immediately or as soon as possible after use, contaminated reusable sharps must be placed in appropriate containers until properly reprocessed (29 CFR 1910.1030(d)(2)(viii)).</p> <p><b>BP.20.11.</b> Containers for sharps must meet specific requirements (29 CFR 1910.1030(d)(2)(viii)).</p> <p><b>BP.20.12.</b> Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a</p>	<p>wash their hands with soap and running water as soon as feasible.</p> <p>Verify that personnel wash their hands immediately or as soon as feasible after removal of gloves or other personal protective equipment.</p> <p>Verify that personnel wash hands and any other skin with soap and water, or flush mucous membranes with water, immediately, or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.</p> <p>Verify that contaminated needles and other contaminated sharps are not bent, recapped, or removed.</p> <p>(NOTE: This requirement does not apply if it can be demonstrated that no alternative is feasible or that such action is required by a specific medical or dental procedure.)</p> <p>Verify that, if bending or recapping of sharps or needle removal is demonstrably necessary, it is accomplished through the use of a mechanical device or a one-handed technique.</p> <p>Verify that contaminated needles are never sheared or broken.</p> <p>Verify that contaminated, reusable sharps are placed in appropriate containers immediately or as soon as possible after use and kept there until properly reprocessed.</p> <p>Verify that containers for sharps are:</p> <ul style="list-style-type: none"> <li>- puncture resistant</li> <li>- properly labelled and color-coded (see definitions)</li> <li>- constructed in such a way that personnel need not reach by hand into the containers if the sharps are contaminated with blood or other potentially infectious materials.</li> </ul> <p>Verify that personnel do not eat, drink, apply cosmetics or lip balm, or handle contact lenses in work areas where there is a reasonable likelihood of occupational exposure.</p>

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<p>reasonable likelihood of occupational exposure (29 CFR 1910.1030(d)(2) (ix)).</p> <p><b>BP.20.13.</b> Food and drink must not be kept in refrigerators, freezers, shelves, cabinets, or on countertops or benchtops where blood or other potentially infectious materials are present (29 CFR 1910.1030(d)(2)(x)).</p> <p><b>BP.20.14.</b> All procedures involving blood or other potentially infectious materials must be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances (29 CFR 1910.1030(d)(2)(xi)).</p> <p><b>BP.20.15.</b> Mouth pipetting/suctioning of blood or other potentially infectious materials is prohibited (29 CFR 1910.1030(d)(2)(xii)).</p> <p><b>BP.20.16.</b> The handling of specimens of blood or other potentially infectious material must meet specific requirements (29 CFR 1910.1030(d)(2)(xiii)).</p>	<p>Verify that neither food nor drink is kept in refrigerators, freezers, shelves, cabinets, or on countertops or benchtops where blood or other potentially infectious materials are present.</p> <p>Verify that all procedures involving blood or other potentially infectious materials are performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.</p> <p>Verify that personnel do not use the techniques of mouth pipetting or suctioning on blood or other potentially infectious materials.</p> <p>Verify that specimens of blood or other potentially infectious materials are placed in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping.</p> <p>Verify that the container for storage, transport, or shipping is properly labeled or color-coded (see definitions) and closed prior to being stored, transported, or shipped.</p> <p>(NOTE: When a facility utilizes universal precautions in the handling of all specimens, the labeling/color-coding of specimens is not necessary provided that containers are recognizable as containing specimens. This exemption applies only while such specimens/containers remain within the facility; proper labeling or color-coding is required when such specimens/containers leave the facility.)</p> <p>Verify that, if outside contamination of the primary container occurs, the primary container is placed within a second container that prevents leakage during handling, processing, storage, transport, or shipping and is properly labeled or color-</p>

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<p><b>BP.20.17.</b> Equipment that may become contaminated with blood or other potentially infectious materials must be examined prior to servicing or shipping, decontaminated as necessary, and handled appropriately (29 CFR 1910.1030 (d)(2)(xiv)).</p> <p><b>BP.20.18.</b> When there is occupational exposure, appropriate personal protective equipment must be provided at no cost to personnel and must be either readily accessible at the worksite or issued to personnel (29 CFR 1910.1030(d)(3)(i) and (d)(3)(iii)).</p> <p><b>BP.20.19.</b> Installations must ensure that personnel with occupational exposure use appropriate personal protective equipment (29 CFR 1910.1030 (d)(3)(ii)).</p>	<p>coded.</p> <p>Verify that, if the specimen could puncture the primary container, the primary container is placed within a secondary container that is puncture-resistant in addition to the above characteristics.</p> <p>Verify that equipment that may become contaminated with blood or other potentially infectious materials is examined prior to servicing or shipping and is decontaminated as necessary.</p> <p>(NOTE: The requirement to decontaminate does not apply if the installation can demonstrate that decontamination of such equipment or portions of such equipment is not feasible.)</p> <p>Verify that a readily observable proper label is attached to the equipment stating that portions remain contaminated.</p> <p>Verify that information on contamination is conveyed to all affected personnel, the servicing representative, and/or the manufacturer, as appropriate, prior to handling, servicing, or shipping so that appropriate precautions will be taken.</p> <p>Verify, when there is occupational exposure, that appropriate personal protective equipment is provided at no cost to personnel.</p> <p>(NOTE: Personal protective equipment includes, but is not limited to, gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices.)</p> <p>(NOTE: Personal protective equipment is considered appropriate only if it does not permit blood or other potentially infectious materials to pass through to or reach the individual's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time that the protective equipment will be used.)</p> <p>Verify that appropriate personal protective equipment in the appropriate sizes is readily accessible at the worksite or is issued to personnel.</p> <p>Verify that the installation ensures that personnel with occupational exposure use appropriate personal protective equipment.</p> <p>(NOTE: This requirement does not apply if the installation shows that the individual temporarily and briefly declined to use personal protective equipment when, under rare and extraordinary circumstances, it was that individual's professional judgment that in the specific instance its use would have prevented the delivery of health care or public safety services or would have posed an increased hazard to the safety of the worker or co-worker.)</p>

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<p><b>BP.20.20.</b> Installations have specific responsibilities with regard to the cleaning and maintenance of required personnel protective equipment (29 CFR 1910.1030(d)(3) (iv) and (d)(3)(v)).</p> <p><b>BP.20.21.</b> Personnel required to use personal protective equipment must carry out certain actions (29 CFR 1910.1030 (d)(3)(vi) through (d)(3)(viii)).</p> <p><b>BP.20.22.</b> Personnel must wear gloves in certain circumstances and handle them in accordance with specific requirements (29 CFR 1910.1030 (d)(3)(ix)).</p>	<p>(NOTE: When the individual makes this judgment, the circumstances will be investigated and documented in order to determine whether changes can be instituted to prevent such occurrences in the future.)</p> <p>Verify that the installation cleans, launders, and disposes of personal protective equipment at no cost to personnel.</p> <p>Verify that the installation repairs or replaces personal protective equipment as needed to maintain its effectiveness, at no cost to personnel.</p> <p>Verify that, if a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) is removed immediately or as soon as feasible.</p> <p>Verify that all personal protective equipment is removed prior to leaving the work area.</p> <p>Verify that, when personal protective equipment is removed, it is placed in an appropriately designated area or container for storage, washing, decontamination, or disposal.</p> <p>Verify that personnel wear gloves:</p> <ul style="list-style-type: none"> <li>- when it can be reasonably anticipated that personnel will have hand contact with blood, other potentially infectious materials, mucous membranes, and nonintact skin</li> <li>- when performing vascular access procedures</li> <li>- when handling or touching contaminated items or surfaces.</li> </ul> <p>Verify that disposable (single use) gloves, such as surgical or examination gloves, are replaced:</p> <ul style="list-style-type: none"> <li>- as soon as practical when contaminated</li> <li>- as soon as feasible if they are torn or punctured</li> <li>- when their ability to function as a barrier is compromised.</li> </ul> <p>Verify that disposable (single use) gloves are not washed or decontaminated for re-use.</p> <p>Verify that utility gloves are discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.</p> <p>(NOTE: Utility gloves may be decontaminated for re-use if the integrity of the glove is not compromised.)</p>

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<b>BP.20.23.</b> Personnel must wear masks in combination with eye protection devices under certain circumstances (29 CFR 1910.1030(d)(3)(x)).	Verify that personnel wear masks in combination with eye protection devices when-ever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.
<b>BP.20.24.</b> Personnel must wear appropriate protective clothing in occupational exposure situations (29 CFR 1910.1030(d)(3)(xi)).	(NOTE: Examples of eye protection devices include, but are not limited to: - goggles or glasses with solid side shields - chin-length face shields.)  Verify that personnel wear appropriate protective clothing in occupational exposure situations.  (NOTE: Examples of appropriate protective clothing include, but are not limited to: gowns, aprons, lab coats, clinic jackets, or similar outer garments.)  (NOTE: The type and characteristics of protective equipment will depend upon the task and degree of exposure anticipated.)
<b>BP.20.25.</b> Personnel must wear surgical caps or hoods and/or shoe covers or boots under certain circumstances (29 CFR 1910.1030(d)(3)(xii)).	Verify that surgical caps or hoods and/or shoe covers or boots are worn in instances when gross contamination can reasonably be anticipated.  (NOTE: Examples of such instances are autopsies and orthopedic surgery.)
<b>BP.20.26.</b> Housekeeping standards and procedures must meet certain requirements (29 CFR 1910.1030(d)(4)(i) and (d)(4)(ii)).	Verify that the worksite is maintained in a clean and sanitary condition.  Verify that there is an appropriate written schedule for cleaning and a method of decontamination based upon the location within the facility, type of surface to be cleaned, type of soil present, and tasks or procedures being performed in the area.  Verify that all equipment and environmental and working surfaces are cleaned and decontaminated after contact with blood or other potentially infectious materials.  Verify that contaminated work surfaces are decontaminated with an appropriate disinfectant:  - after completion of procedures - immediately or as soon as feasible when surfaces are overtly contaminated - after any spill of blood or other potentially infectious materials - at the end of the work shift if the surface may have become contaminated since the last cleaning.

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<p><b>BP.20.27.</b> Contaminated sharps must be handled in accordance with specific requirements (29 CFR 1910.1030(d)(4)(iii)(A)).</p>	<p>Verify that protective coverings used to cover equipment and environmental surfaces are removed and replaced as soon as feasible when they become overtly contaminated or at the end of the workshift if they may have become contaminated during the shift.</p> <p>(NOTE: The following are examples of protective coverings: plastic wrap, aluminum foil, or imperviously backed absorbent paper.)</p> <p>Verify that all bins, pails, cans, and similar receptacles intended for reuse that have a reasonable likelihood for becoming contaminated with blood or other potentially infectious materials are inspected and decontaminated on a regularly scheduled basis and cleaned and decontaminated immediately or as soon as feasible upon visible contamination.</p> <p>Verify that broken glassware that may be contaminated is cleaned up using mechanical means instead of being picked up directly with the hands.</p> <p>(NOTE: The following are examples of mechanical means: a brush and dust pan, tongs, or forceps.)</p> <p>Verify that reusable sharps that are contaminated with blood or other potentially infectious materials are not stored or processed in a manner that requires personnel to reach by hand into the containers where these sharps have been placed.</p> <p>Verify that contaminated sharps are discarded immediately or as soon as feasible in containers that are:</p> <ul style="list-style-type: none"> <li>- closable</li> <li>- puncture resistant</li> <li>- leakproof on sides and bottom</li> <li>- properly labeled or color-coded (see definitions).</li> </ul> <p>Verify that, during use, containers for sharps are:</p> <ul style="list-style-type: none"> <li>- easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found (e.g., laundries)</li> <li>- maintained upright throughout use</li> <li>- replaced routinely and not allowed to overfill.</li> </ul> <p>Verify that, when moving containers of contaminated sharps from the area of use, the containers are:</p> <ul style="list-style-type: none"> <li>- closed immediately prior to removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping</li> <li>- placed in a secondary container if leakage is possible.</li> </ul>

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<p><b>BP.20.28.</b> Containers for regulated waste other than sharps must meet specific requirements (29 CFR 1910.1030 (d)(4)(iii)(B)(1)).</p> <p><b>BP.20.29.</b> If outside contamination of a regulated waste container occurs, the waste must be placed in a second container that meets specific requirements (29 CFR 1910.1030(d)(4)(iii)(B)(2)).</p> <p><b>BP.20.30.</b> The handling of contaminated laundry must meet specific requirements (29 CFR 1910.1030(d)(4)(iv)(A)).</p>	<p>Verify that, if needed, the second container is:</p> <ul style="list-style-type: none"> <li>- closable</li> <li>- constructed to contain all contents and prevent leakage during handling, storage, transport, or shipping</li> <li>- properly labeled or color-coded.</li> </ul> <p>Verify that reusable containers are not opened, emptied, or cleaned manually or in any other manner that would expose personnel to the risk of percutaneous injury.</p> <p>Verify that regulated waste is placed in containers that are:</p> <ul style="list-style-type: none"> <li>- closable</li> <li>- constructed to contain all contents and prevent leakage of fluids during handling, storage, transport or shipping</li> <li>- properly labeled or color-coded</li> <li>- closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.</li> </ul> <p>Verify that regulated waste is placed in a second container, if outside contamination of the first container occurs.</p> <p>Verify that, if needed, the second container is:</p> <ul style="list-style-type: none"> <li>- closable</li> <li>- constructed to contain all contents and prevent leakage of fluids during handling, storage, transport, or shipping</li> <li>- properly labeled or color-coded</li> <li>- closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.</li> </ul> <p>Verify that contaminated laundry is handled as little as possible and with a minimum of agitation.</p> <p>Verify that contaminated laundry is bagged or containerized at the location where it was used and is not sorted or rinsed in the location of use.</p> <p>Verify that contaminated laundry is placed and transported in bags or containers that are properly labeled or color-coded.</p> <p>(NOTE: When a facility uses universal precautions in the handling of all soiled laundry, labeling or color-coding is different from that required by 29 CFR 1910.1030(g)(1) (see checklist items BP.40.1 and BP.40.2). Labeling is sufficient if it permits all personnel to recognize the containers as requiring compliance with universal precautions.)</p>

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<p><b>BP.20.31.</b> Installations must ensure that personnel who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment (29 CFR 1910.1030 (d)(4)(iv)(B)).</p> <p><b>BP.20.32.</b> Contaminated laundry shipped offsite to a second facility that does not utilize universal precautions in the handling of all laundry must be handled in accordance with specific requirements (29 CFR 1910.1030 (d)(4)(iv)(C)).</p>	<p>Verify that, whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through of or leakage from the bag or container, the laundry is placed and transported in bags or containers that prevent soak-through and/or leakage of fluids to the exterior.</p> <p>Verify that the installation ensures that personnel who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.</p> <p>Determine whether the installation ships its contaminated laundry to an offsite facility that uses universal precautions in the handling of all laundry.</p> <p>Verify that, in the event that the receiving facility does not use universal precautions in the handling of all laundry, that the installation's contaminated laundry is placed in bags or containers that are properly labeled or color-coded.</p>



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<p><b>BP.30</b>  <b>HEPATITIS B</b>  <b>VACCINATIONS AND</b>  <b>POST-EXPOSURE</b>  <b>EVALUATION AND</b>  <b>FOLLOW-UP</b></p> <p><b>BP.30.1.</b> Installations must make available the hepatitis B vaccine and vaccination series to all personnel who have occupational exposure, and post-exposure evaluation and follow-up to all personnel who have had an exposure incident (29 CFR 1910.1030(f)(1)).</p> <p><b>BP.30.2.</b> The provision of the hepatitis B vaccination is subject to particular requirements (29 CFR 1910.1030(f)(2)).</p>	<p>Verify that the hepatitis B vaccine and vaccination series is available to all personnel who have occupational exposure.</p> <p>Verify that post-exposure evaluation and follow-up is available to all personnel who have had an exposure incident.</p> <p>Verify that all medical evaluations and procedures (including the hepatitis B vaccine and vaccination series and post-exposure evaluation and follow-up, including prophylaxis) are:</p> <ul style="list-style-type: none"> <li>- made available at no cost</li> <li>- made available at a reasonable time and place</li> <li>- performed by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional</li> <li>- provided according to recommendations of the U.S. Public Health Service current at the time these evaluations and procedures take place.</li> </ul> <p>Verify that all laboratory tests are conducted by an accredited laboratory at no cost to affected personnel.</p> <p>Verify that the hepatitis B vaccination is made available after the individual has received the training required under this protocol and within 10 working days of initial assignment to all personnel who have occupational exposure.</p> <p>(NOTE: This requirement does not apply if an individual has previously received the complete hepatitis B vaccination series, if antibody testing has revealed that the individual is immune, or if the vaccine is contraindicated for medical reasons.)</p> <p>Verify that the installation does not make participation in a prescreening program a prerequisite for receiving hepatitis B vaccination.</p> <p>Verify that, if a routine booster dose(s) of hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) are made available in accordance with the provisions of this requirement.</p>

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<p><b>BP.30.3.</b> Post-exposure evaluation and follow-up for HBV are subject to specific requirements (29 CFR 1910.1030(f)(3)).</p>	<p>Verify that, following a report of an exposure incident, the installation immediately makes available to the exposed individual a confidential medical evaluation and follow-up.</p> <p>Verify that the post-exposure follow-up includes at least the following elements:</p> <ul style="list-style-type: none"> <li>- documentation of the route(s) of exposure and the circumstances under which the exposure incident occurred</li> <li>- identification and documentation of the source individual</li> <li>- a test of the source individual's blood, run as soon as feasible and after consent is obtained, in order to determine HBV and HIV infectivity</li> <li>- information on the results of the source individual's testing</li> <li>- information applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual</li> <li>- collection and testing of exposed individual's blood for HBV and HIV as soon as feasible, with tests occurring after consent is obtained</li> <li>- post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service</li> <li>- counseling</li> <li>- evaluation of reported illnesses.</li> </ul> <p>(NOTE: The requirement to identify the source individual does not apply if the installation can establish that such identification is infeasible or prohibited by state or local law.)</p> <p>(NOTE: If consent for a blood test is not obtained, the installation must establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, must be tested and the results documented.)</p> <p>(NOTE: When the source individual is already known to be infected with HBV or HIV, the installation need not repeat testing for the source individual's HBV or HIV status.)</p> <p>(NOTE: If the source individual consents to baseline blood collection, but does not give consent at that time for HIV serologic testing, the sample should be preserved for at least 90 days. If, within 90 days of the exposure incident, the individual elects to have the baseline sample tested, such testing should be done as soon as feasible.)</p>

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<p><b>BP.30.4.</b> Installations must provide specific information to the health-care professional(s) involved in giving vaccinations or conducting post-exposure follow-up (29 CFR 1910.1030(f)(4)).</p> <p><b>BP.30.5.</b> Installations must obtain and provide the affected individual with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation (29 CFR 1910.1030(f)(5)).</p>	<p>Verify that the healthcare professional responsible for the individual's Hepatitis B vaccination is provided a copy of 29 CFR 1910.1030.</p> <p>Verify that the healthcare professional evaluating an individual after an exposure incident is provided the following information:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1910.1030</li> <li>- a description of the exposed individual's duties as they relate to the exposure incident</li> <li>- documentation of the route(s) of exposure and circumstances under that exposure occurred</li> <li>- results of the source individual's blood testing, if available</li> <li>- all medical records relevant to the appropriate treatment of the individual (including vaccination status) that it is the installation's responsibility to maintain.</li> </ul> <p>Verify that the installation obtains and provides the affected individual with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation.</p> <p>(NOTE: The healthcare professional's written opinion for hepatitis B vaccination is limited to whether hepatitis B vaccination is indicated for an individual, and if the individual has received such vaccination.)</p> <p>(NOTE: The healthcare professional's written opinion for post-exposure evaluation and follow-up is limited to the following information:</p> <ul style="list-style-type: none"> <li>- that the individual has been informed of the results of the evaluation</li> <li>- that the individual has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials that require further evaluation or treatment.)</li> </ul> <p>Verify that all findings not included in the above notes remain confidential and are not included in the written report.</p>



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<p><b>BP.40 HAZARD COMMUNICATION</b></p> <p><b>BP.40.1.</b> Warning labels must be affixed to certain containers and objects (29 CFR 1910.1030(g)(1)(i)(A), (g)(1)(i)(E) through (g)(1)(i)(G) and (g)(1)(i)(I)).</p> <p><b>BP.40.2.</b> Required labels must meet specific requirements (29 CFR 1910.1030(g)(1)(i)(B) through (g)(1)(i)(D)).</p> <p><b>BP.40.3.</b> Personnel with occupational exposure must participate in a training program (29 CFR 1910.1030(g)(2)(i)).</p> <p><b>BP.40.4.</b> The timing of training must meet specific requirements (29 CFR 1910.1030(g)(2)(ii) and (g)(2)(v)).</p>	<p>Verify that warning labels are affixed to containers of regulated waste, refrigerators and freezers containing blood or other potentially infectious material, and other containers used to store, transport, or ship blood or other potentially infectious materials.</p> <p>(NOTE: This requirement does not apply to:</p> <ul style="list-style-type: none"> <li>- containers of blood, blood components, or blood products that are labeled as to their contents and have been released for transfusion or other clinical use</li> <li>- individual containers of blood or other potentially infectious materials that are placed in a labeled container during storage, transport, shipment, or disposal</li> <li>- regulated waste that has been decontaminated.)</li> </ul> <p>(NOTE: Red bags or red containers may be substituted for labels; they need not be used to contain decontaminated regulated waste, however.)</p> <p>Verify that labels required by 29 CFR 1910.1030(g)(1)(i)(A) (see checklist item BP.40.1):</p> <ul style="list-style-type: none"> <li>- include the biohazard symbol</li> <li>- are fluorescent orange or orange-red or predominantly so, with lettering and symbols in a contrasting color</li> <li>- are affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.</li> </ul> <p>Verify that all personnel with occupational exposure participate in a training program.</p> <p>Verify that the training program is provided at no cost to personnel and during working hours.</p> <p>Verify that training is provided:</p> <ul style="list-style-type: none"> <li>- at the time of initial assignment to tasks where occupational exposure may take place</li> <li>- at least annually thereafter.</li> </ul> <p>Verify that additional training is provided when modification of tasks or procedures or the institution of new tasks or procedures affect the occupational exposure of personnel.</p>

**COMPLIANCE CATEGORY:**  
**EOH: BLOODBORNE PATHOGENS**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BP.40.5.</b> Required personnel training must meet specific standards as to form and content (29 CFR 1910.1030(g)(2)(vi) through (g)(2)(viii)).</p>	<p>(NOTE: Additional training may be limited to addressing the new exposures created.)</p> <p>Verify that the person conducting personnel training is knowledgeable in the training program subject matter as it relates to the workplace that training will address.</p> <p>Verify that the person conducting training uses material appropriate in content and vocabulary to educational level, literacy, and language of personnel.</p> <p>Verify that the training program contain, at a minimum, the following elements:</p> <ul style="list-style-type: none"> <li>- an accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents</li> <li>- a general explanation of the epidemiology and symptoms of bloodborne diseases</li> <li>- an explanation of the modes of transmission of bloodborne pathogens</li> <li>- an explanation of the installation's exposure control plan and the means by which personnel can obtain a copy of the written plan</li> <li>- an explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials</li> <li>- an explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment</li> <li>- information on the types, proper use, location, removal, handling, decontamination and disposal of personal protective equipment</li> <li>- an explanation of the basis for selection of personal protective equipment</li> <li>- information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge</li> <li>- information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials</li> <li>- an explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available</li> <li>- information on the post-exposure evaluation and follow-up that the installation provides for personnel following an exposure incident</li> <li>- an explanation of proper signs and labels and/or color coding</li> <li>- an opportunity for interactive questions and answers with the person conducting the training session.</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BP.50</b>  <b>RECORDKEEPING</b></p> <p><b>BP.50.1.</b> Installations must establish and maintain an accurate medical record for each person with occupational exposure (29 CFR 1910.1030 (h)(1)(i) through (h)(1)(iv)).</p> <p><b>BP.50.2.</b> Installations must keep records of the training required for each person with occupational exposure (29 CFR 1910.1030(h)(2)).</p> <p><b>BP.50.3.</b> Installations must make medical and training records available to certain parties under specific circumstances (29 CFR 1910.1030(h)(2)).</p>	<p>Verify that the installation has established and maintains an accurate record for each person with occupational exposure, in accordance with 29 CFR 1910.1020.</p> <p>Verify that the record includes:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the individual</li> <li>- a copy of the individual's hepatitis B vaccination status including the dates of all the hepatitis B vaccinations and any medical records relative to the individual's ability to receive vaccination</li> <li>- a copy of all results of examinations, medical testing, and follow-up procedures</li> <li>- the installation's copy of the healthcare professional's written opinion</li> <li>- a copy of the information provided to the healthcare professional.</li> </ul> <p>Verify that the medical records:</p> <ul style="list-style-type: none"> <li>- are kept confidential</li> <li>- are not disclosed or reported without the individual's express written consent to any person within or outside the workplace except as may be required by law</li> <li>- are maintained for at least the duration of employment plus 30 yr.</li> </ul> <p>Verify that training records are kept and include the following information:</p> <ul style="list-style-type: none"> <li>- the dates of the training sessions</li> <li>- the contents or a summary of the training sessions</li> <li>- the names and qualifications of persons conducting the training</li> <li>- the names and job titles of all persons attending the training sessions.</li> </ul> <p>Verify that training records are maintained for 3 yr from the date on which the training occurred.</p> <p>Verify that the installation makes all records available upon request to the Assistant Secretary and the Director for examination and copying.</p> <p>Verify that the installation provides training records upon request for examination and copying to personnel, their representatives, the Director, or to the Assistant Secretary.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BP.50.4.</b> Transfer of records in the event of reassignment or installation closure must meet specific requirements (29 CFR 1910.1030(h)(4)).</p>	<p>Verify that the installation provides an individual's medical records upon request for examination and copying to the subject individual, to anyone having written consent of the subject individual, to the Director, or to the Assistant Secretary.</p> <p>Verify that, in the event of personnel reassignment, all monitoring and medical removal records accompany affected personnel and are retained by the new installation or employer.</p> <p>Verify that, in the event of installation closure, all monitoring and medical removal records are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.)</p>

## **CHAPTER 31**

### **EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES**

## CHAPTER 31

### EOH: EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES

#### ECAMP-ANG

September 1997

#### Applicability

This chapter covers installations whose personnel are engaged in emergency response *no matter where it occurs*, except that it does not cover personnel engaged in operations specified in 29 CFR 1910.120(a)(1)(i) through 1910.120(a)(1)(iv).

Those emergency response organizations who have developed and implemented equivalent programs for handling releases of hazardous substances pursuant to section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act of 1986, 42 USC 11003) are considered to have met the requirements of 29 CFR 1910.120(q).

#### Compliance Definitions

- *Buddy System* - a system of organizing personnel into work groups in such a manner that each member of the work group is designated to be observed by at least one other individual in the work group. The purpose of the buddy system is to provide rapid assistance to personnel in the event of an emergency (29 CFR 1910.120(a)(3)).
- *Clean-up Operation* - an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment (29 CFR 1910.120(a)(3)).
- *Decontamination* - the removal of hazardous substances from personnel and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects (29 CFR 1910.120(a)(3)).
- *Emergency Response or Responding to Emergencies* - a response effort by personnel from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by personnel in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of 29 CFR 1910.120. Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses (29 CFR 1910.120(a)(3)).
- *Facility* - (a) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (b) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; it does not include any consumer product in consumer use or any water-borne vessel (29 CFR 1910.120(a)(3)).
- *First Responders at the Awareness Level* - individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the authorities of the release (29 CFR 1910.120(q)(6)(i)).

- *First Responders at the Operations Level* - individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures (29 CFR 1910.120(q)(6)(ii)).
- *Hazardous Materials Specialists* - individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local and other government authorities in regards to site activities (29 CFR 1910.120(q)(6)(iv)).
- *Hazardous Materials Technicians* - individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance (29 CFR 1910.120(q)(6)(iii)).
- *Hazardous Substance* - any substance designated or listed under (a) through (d) of this definition, exposure to which results or may result in adverse effects on the health or safety of personnel:
  - (a) any substance defined under section 101(14) of CERCLA
  - (b) any biologic agent and other disease causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such persons or their offspring
  - (c) any substance listed by the U.S. Department of Transportation (DOT) as hazardous materials under 49 CFR 172.101
  - (d) hazardous waste as defined below (29 CFR 1910.120(a)(3)).
- *Hazardous Waste* - a waste or combination of wastes as defined in 40 CFR 261.3, or those substances defined as hazardous wastes in 49 CFR 171 (29 CFR 1910.120(a)(3)).
- *Hazardous Waste Operation* - any operation conducted within the scope of 29 CFR 1910.120. The Hazardous Waste Operations and Emergency Response standard includes the following in its scope:
  - (a) clean-up operations required by a governmental body, whether Federal, state local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained)
  - (b) corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 USC 6901 et seq.)
  - (c) voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites
  - (d) operations involving hazardous waste that are conducted at treatment, storage, disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S. Environmental Protection Agency (USEPA) to implement RCRA regulations
  - (e) emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard (29 CFR 1910.120(a)(1) and 1910.120(a)(3)).
- *Hazardous Waste Site* - any facility or location within the scope of 29 CFR 1910.120 at which hazardous waste operations take place (29 CFR 1910.120(a)(3)).

- *Health Hazard* - for hazardous waste operations and emergency response, a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed personnel. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes (29 CFR 1910.120(a)(3)).
- *Personal Protective Equipment (PPE)* - for the purposes of hazardous waste operations and emergency response. PPE is divided into four categories, based on the level of protection provided: (29 CFR 1910.120(a)(3) and Appendix B to 29 CFR 1910.120)

Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment; it may be used as appropriate:

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit
3. Coveralls<sup>1</sup>
4. Long underwear<sup>1</sup>
5. Gloves, outer, chemical-resistant
6. Gloves, inner, chemical-resistant
7. Boots, chemical-resistant, steel toe and shank
8. Hard hat (under suit)<sup>1</sup>
9. Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally-encapsulating suit)

<sup>1</sup>Optional, as applicable.

(NOTE: Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin,
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.)

Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. The following constitute Level B equipment; it may be used as appropriate:

1. Positive pressure, full-facepiece SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH approved)
2. Hooded chemical-resistant clothing (coveralls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant coveralls)
3. Coveralls<sup>1</sup>
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant
6. Boots, outer, chemical-resistant steel toe and shank

7. Boot-covers, outer, chemical-resistant (disposable)<sup>1</sup>
8. Hard hat<sup>1</sup>
9. Face shield<sup>1</sup>

<sup>1</sup>Optional, as applicable.

(NOTE: Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin. (This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.))

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. The following constitute Level C equipment; it may be used as appropriate:

1. Full-face or half-mask, air purifying respirators (NIOSH approved)
2. Hooded chemical-resistant clothing (coveralls; two-piece chemical-splash suit; disposable chemical-resistant coveralls)
3. Coveralls<sup>1</sup>
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant
6. Boots (outer), chemical-resistant steel toe and shank<sup>1</sup>
7. Boot-covers, outer, chemical-resistant (disposable)<sup>1</sup>
8. Hard hat<sup>1</sup>
9. Escape mask<sup>1</sup>
10. Face shield<sup>1</sup>

(NOTE: Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.)

Level D - A work uniform affording minimal protection: used for nuisance contamination only. The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.
2. Gloves<sup>1</sup>
3. Boots/shoes, chemical-resistant steel toe and shank
4. Boots, outer, chemical-resistant (disposable)<sup>1</sup>
5. Safety glasses or chemical splash goggles<sup>1</sup>
6. Hard hat<sup>1</sup>
7. Escape mask<sup>1</sup>
8. Face shield<sup>1</sup>

<sup>1</sup>Optional, as applicable.

(NOTE: Level D protection should be used when:

1. The atmosphere contains no known hazard; and

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals (Combinations of PPE other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.))

- *Senior Official* - the most senior official on the site of an emergency response to a release of hazardous substances who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established (note to 29 CFR 1910.120(q)(3)(i)).
- *Site* - see Hazardous Waste Site (29 CFR 1910.120(a)(3)).
- *Skilled Support Personnel* - personnel, not necessarily an installation's own personnel, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by installation personnel (29 CFR 1910.120(q)(4)).
- *Specialist Personnel* - personnel who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge (29 CFR 1910.120(q)(5)).
- *Uncontrolled Hazardous Waste Site* - an area where an accumulation of hazardous waste creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands, such as those created by former municipal, county or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous waste. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at TSD sites are not covered by this definition (29 CFR 1910.120(a)(3)).



**EOH: EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES**

**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	ER.10.1 through ER.10.15	31-9



**COMPLIANCE CATEGORY:**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>ER.10 GENERAL REQUIREMENTS</b></p> <p><b>ER.10.1.</b> Installations must develop and implement a written emergency response plan (29 CFR 1910.120(q)(1)).</p> <p><b>ER.10.2.</b> The emergency response plan must meet certain requirements with regard to content (29 CFR 1910.120(q)(2)).</p> <p><b>ER.10.3.</b> Certain procedures must be followed in the course of response to an emergency (29 CFR 1910.120(q)(3)).</p>	<p>Verify that the installation has developed and implemented a written emergency response plan.</p> <p>Verify that the plan is available for inspection and copying by personnel, their representatives, and OSHA personnel.</p> <p>(NOTE: Installations that evacuate their personnel from the danger area when an emergency occurs, and who do not permit any of their personnel to assist in handling the emergency, are exempt from the requirements of 29 CFR 1910.120(q) (i.e., this chapter), if they provide an emergency action plan that complies with 29 CFR 1910.38(a).)</p> <p>Verify that the emergency response plan addresses the following topics, at a minimum, to the extent that they are not addressed elsewhere:</p> <ul style="list-style-type: none"> <li>- pre-emergency planning and coordination with outside parties</li> <li>- personnel roles, lines of authority, training, and communication</li> <li>- emergency recognition and prevention</li> <li>- safe distances and places of refuge</li> <li>- site security and control</li> <li>- evacuation routes and procedures</li> <li>- decontamination</li> <li>- emergency medical treatment and first aid</li> <li>- emergency alerting and response procedures</li> <li>- critique of response and follow-up</li> <li>- PPE and emergency equipment.</li> </ul> <p>(NOTE: Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the use of the installation and its personnel.)</p> <p>Verify that the senior emergency response official responding to an emergency becomes the individual in charge of a site-specific Incident Command System (ICS).</p>

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	<p>Verify that all emergency responders and their communications are coordinated and controlled through the individual in charge of the ICS, assisted by the senior official present for each employer.</p> <p>Verify that the individual in charge of the ICS identifies, to the extent possible, all hazardous substances or conditions present.</p> <p>Verify that the individual in charge of the ICS addresses (as appropriate) site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.</p> <p>Verify that, based on the hazardous substances and/or conditions present, the individual in charge of the ICS implements appropriate emergency operations and ensures that the PPE worn is appropriate for the hazards to be encountered.</p> <p>Verify that PPE meets, at a minimum, the criteria contained in 29 CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage for any incident.</p> <p>Verify that personnel engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard wear positive pressure SCBA while engaged in emergency response, until such time as the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to them.</p> <p>Verify that the individual in charge of the ICS limits the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations.</p> <p>Verify that operations in hazardous areas are performed using the buddy system in groups of two or more.</p> <p>Verify that back-up personnel are standing by with equipment ready to provide assistance or rescue.</p> <p>Verify that qualified basic life support personnel, as a minimum, are also be standing by with medical equipment and transportation capability.</p> <p>Verify that the individual in charge of the ICS designates a safety officer who is knowledgeable in the operations being implemented at the emergency response site and who has specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.</p>

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<p><b>ER.10.4.</b> Skilled support personnel must meet specific training requirements (29 CFR 1910.120(q)(4)).</p> <p><b>ER.10.5.</b> Specialist personnel must meet specific training requirements (29 CFR 1910.120(q)(5)).</p> <p><b>ER.10.6.</b> First responders at the awareness level must meet specific requirements as to training (29 CFR 1910.120(q) (6)(i)).</p>	<p>(NOTE: When activities are judged by the safety officer to be an IDLH and/or to involve an imminent danger condition, the safety officer has the authority to alter, suspend, or terminate those activities.)</p> <p>Verify that the safety official immediately informs the individual in charge of the ICS of any actions needed to be taken to correct such hazards at the emergency scene.</p> <p>Verify that, after emergency operations have terminated, the individual in charge of the ICS implements appropriate decontamination procedures.</p> <p>(NOTE: When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating.)</p> <p>Verify that all compressed air cylinders used with SCBA meet U.S. DOT and NIOSH criteria.</p> <p>Verify that skilled support personnel are given an initial briefing at the site prior to their participation in any emergency response.</p> <p>(NOTE: Skilled support personnel are not required to meet the training required in 29 CFR 1910.120 for the installation's regular personnel.)</p> <p>Verify that the initial briefing includes instruction in the wearing of appropriate PPE, what chemical hazards are involved, and what duties are to be performed.</p> <p>Verify that all other appropriate safety and health precautions provided to the installation's own personnel are used to ensure the safety and health of skilled support personnel.</p> <p>Verify that special personnel receive training or demonstrate competency in the area of their specialization annually.</p> <p>Verify that first responders at the awareness level have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:</p> <ul style="list-style-type: none"> <li>- an understanding of what hazardous substances are, and the risks associated with them in an incident</li> <li>- an understanding of the potential outcomes associated with an emergency created when hazardous substances are present</li> <li>- the ability to recognize the presence of hazardous substances in an emergency</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>ER.10.7.</b> First responders at the operations level must meet specific requirements as to training (29 CFR 1910.120(q) (6)(ii)).</p>	<ul style="list-style-type: none"> <li>- the ability to identify the hazardous substances, if possible</li> <li>- an understanding of the role of the first responder awareness individual in the installation's emergency response plan, including site security and control and the U.S. DOT's Emergency Response Guidebook</li> <li>- the ability to realize the need for additional resources, and to make appropriate notifications to the communication center.</li> </ul> <p>Verify that first responders at the operational level have received at least 8 h of training or have had sufficient experience to objectively demonstrate competency in the following areas, in addition to those listed for the awareness level, and that the installation so certifies:</p> <ul style="list-style-type: none"> <li>- knowledge of the basic hazard and risk assessment techniques</li> <li>- know how to select and use proper PPE provided to the first responder operational level</li> <li>- an understanding of basic hazardous materials terms</li> <li>- know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and PPE available with their unit</li> <li>- know how to implement basic decontamination procedures</li> <li>- an understanding of the relevant standard operating procedures and termination procedures.</li> </ul>
<p><b>ER.10.8.</b> Hazardous materials technicians must meet specific requirements as to training (29 CFR 1910.120(q) (6)(iii)).</p>	<p>Verify that hazardous materials technicians have received at least 24 h of training equal to the first responder operations level and in addition have competency in the following areas, and that the installation so certifies:</p> <ul style="list-style-type: none"> <li>- know how to implement the installation's emergency response plan</li> <li>- know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment</li> <li>- be able to function within an assigned role in the Incident Command System</li> <li>- know how to select and use proper specialized chemical PPE provided to the hazardous materials technician</li> <li>- understand hazard and risk assessment techniques</li> <li>- be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and PPE available with the unit</li> <li>- understand and implement decontamination procedures</li> <li>- understand termination procedures</li> <li>- understand basic chemical and toxicological terminology and behavior.</li> </ul>
<p><b>ER.10.9.</b> Hazardous materials specialists must meet specific requirements as to training (29 CFR</p>	<p>Verify that hazardous materials specialists have received at least 24 h of training equal to the technician level and in addition have competency in the following areas, and that the installation so certifies:</p>

**COMPLIANCE CATEGORY:**  
**EOH: EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p>1910.120(q)(6)(iv)).</p> <p><b>ER.10.10.</b> On scene incident commanders who will assume control of the incident scene beyond the first responder awareness level must meet specific training requirements (29 CFR 1910.120(q)(6)(v)).</p> <p><b>ER.10.11.</b> Trainers who teach any of the above subjects must meet specific requirements (29 CFR 1910.120(q)(7)).</p> <p><b>ER.10.12.</b> Certain personnel must receive annual refresher training (29 CFR 1910.120(q)(8)).</p>	<ul style="list-style-type: none"> <li>- know how to implement the local emergency response plan</li> <li>- understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment</li> <li>- know the state emergency response plan</li> <li>- be able to select and use proper specialized chemical PPE provided to the hazardous materials specialist</li> <li>- understand in-depth hazard and risk techniques</li> <li>- be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and PPE available</li> <li>- be able to determine and implement decontamination procedures</li> <li>- have the ability to develop a site safety and control plan</li> <li>- understand chemical, radiological and toxicological terminology and behavior.</li> </ul> <p>Verify that on scene incident commanders who will assume control of the incident scene beyond the first responder awareness level receive at least 24 h of training equal to the first responder operations level and in addition have competency in the following areas, and that the installation so certifies:</p> <ul style="list-style-type: none"> <li>- know and be able to implement the installation's incident command system</li> <li>- know how to implement the installation's emergency response plan</li> <li>- know and understand the hazards and risks associated with personnel working in chemical protective clothing</li> <li>- know how to implement the local emergency response plan</li> <li>- know of the state emergency response plan and of the Federal Regional Response Team</li> <li>- know and understand the importance of decontamination procedures.</li> </ul> <p>Verify that trainers who teach any of the above training subjects have either:</p> <ul style="list-style-type: none"> <li>- satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. National Fire Academy, or</li> <li>- have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.</li> </ul> <p>Verify that personnel who are trained in accordance with 29 CFR 1910.120(q)(6) (see checklist items ER.10.6 through ER.10.10) either:</p> <ul style="list-style-type: none"> <li>- receive annual refresher training of sufficient content and duration to maintain their competencies, or</li> <li>- demonstrate competency in those areas at least yearly.</li> </ul> <p>Verify that a statement is made of the training or competency.</p>

**COMPLIANCE CATEGORY:**  
**EOH: EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASES**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>ER.10.13.</b> Medical surveillance and consultation that meets specific requirements must be provided to certain individuals (29 CFR 1910.120 (q)(9)).</p> <p><b>ER.10.14.</b> Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists, must meet specific requirements (29 CFR 1910.120(q)(10)).</p> <p><b>ER.10.15.</b> Installations must meet certain requirements upon completion of the emergency response under certain conditions (29 CFR 1910.120(q)(11)).</p>	<p>Verify that, if a statement of competency is made, the installation keeps a record of the methodology used to demonstrate competency.</p> <p>Verify that members of an organized and designated HAZMAT team and hazardous materials specialists receive a baseline physical examination and are provided with medical surveillance as required under 29 CFR 1910.120(f).</p> <p>Verify that any emergency response personnel who exhibit signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident, either immediately or subsequently, are provided with medical consultation as required under 29 CFR 1910.120(f)(3)(ii).</p> <p>Verify that chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists, meets the requirements of 29 CFR 1910.120(g)(3) through 1910.120(g)(5).</p> <p>Determine whether, upon completion of the emergency response, it is necessary to remove hazardous substances, health hazards and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident.</p> <p>Verify that those conducting the clean-up comply with one of the following:</p> <ul style="list-style-type: none"> <li>- meet all the requirements of 29 CFR 1910.120(b) through 1910.120(o), or</li> <li>- where the clean-up is done on plant property using plant or workplace personnel, such personnel have completed the training requirements of the following: <ul style="list-style-type: none"> <li>- 29 CFR 1910.38(a)</li> <li>- 29 CFR 1910.134</li> <li>- 29 CFR 1910.1200, and</li> <li>- other appropriate safety and health training made necessary by the tasks that they are expected to be performed such as PPE and decontamination procedures.</li> </ul> </li> </ul> <p>Verify that all equipment to be used in the performance of the clean-up work is in serviceable condition and has been inspected prior to use.</p>

## **CHAPTER 32**

### **SANITATION**

**CHAPTER 32**  
**EOH: SANITATION**  
**ECAMP-ANG**  
**September 1997**

**Compliance Definitions**

- *Lavatory* - a basin or similar vessel used exclusively for washing of the hands, arms, face, and head (29 CFR 1910.141(a)(2)(i)).
- *Nonwater Carriage Toilet Facility* - a toilet facility not connected to a sewer (29 CFR 1910.141(a)(2)(ii)).
- *Number of Employees* - unless otherwise specified, the maximum number of employees present at any one time on a regular shift (29 CFR 1910.141(a)(2)(iii)).
- *Personal Service Room* - a room used for activities not directly connected with the production or service function performed by the establishment. Such activities include, but are not limited to, first-aid, medical services, dressing, showering, toilet use, washing, and eating (29 CFR 1910.141(a)(2)(iv)).
- *Potable Water* - water that meets the quality standards prescribed in the U.S. Public Health Service Drinking Water Standards, published in 42 CFR 72, or water that is approved for drinking purposes by the state or local authority having jurisdiction (29 CFR 1910.141(a)(2)(v)).
- *Toilet Facility* - a fixture maintained within a toilet room for the purpose of defecation or urination, or both (29 CFR 1910.141(a)(2)(vi)).
- *Toilet Room* - a room maintained within or on the premises of any place of employment, containing toilet facilities for use by employees (29 CFR 1910.141(a)(2)(vii)).
- *Toxic Material* - a material in concentration or amount which exceeds the applicable limit established by a standard, such as 29 CFR 1910.1000 and 29 CFR 1910.1001 or, in the absence of an applicable standard, which is one of such toxicity so as to constitute a recognized hazard that is causing or is likely to cause death or serious physical harm (29 CFR 1910.141(a)(2)(viii)).
- *Urinal* - a toilet facility maintained within a toilet room for the sole purpose of urination (29 CFR 1910.141(a)(2)(ix)).
- *Water Closet* - a toilet facility maintained within a toilet room for the purpose of both defecation and urination and that is flushed with water (29 CFR 1910.141(a)(2)(x)).
- *Wet Process* - any process or operation in a workroom that normally results in surfaces upon which employees may walk or stand becoming wet (29 CFR 1910.141(a)(2)(xi)).



# EOH: SANITATION

## GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
General		
Housekeeping	SN.10.1 through SN.10.4	32-5
Waste Disposal	SN.20.1 and SN.20.2	32-7
Vermin Control	SN.30.1	32-9
Water Supply		
Potable Water	SN.40.1 through SN.40.4	32-11
Nonpotable Water	SN.50.1 through SN.50.3	32-13
Toilet Facilities	SN.60.1 through SN.60.3	32-15
Washing Facilities	SN.70.1 through SN.70.7	32-17
Change Rooms	SN.80.1	32-19
Clothes Drying Facility	SN.90.1	32-21
Consumption of Food and Beverages on the Premises	SN.100.1 and SN.100.2	32-23
Food Handling	SN.110.1	32-25

Appendix 32-1. *Number of Water Closets Required for Installations*

32-27



**COMPLIANCE CATEGORY:**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>GENERAL</b></p> <p><b>SN.10</b> <b>Housekeeping</b></p> <p><b>SN.10.1.</b> All places of employment must be kept clean (29 CFR 1910.141(a)(3)(i)).</p> <p><b>SN.10.2.</b> All workroom floors must be maintained in a dry condition when practicable (29 CFR 1910.141(a)(3)(ii)).</p> <p><b>SN.10.3.</b> Installations must take specific actions where wet processes are used (29 CFR 1910.141(a)(3)(ii)).</p> <p><b>SN.10.4.</b> Floors, working places, and passage-ways must be maintained in such a way as to facilitate cleaning (29 CFR 1910.141(a)(3)(iii)).</p>	<p>Verify that the place of employment is kept clean to the extent that the nature of the work allows.</p> <p>Verify that workroom floors are maintained in a dry condition so far as practicable.          (NOTE: This requirement does not apply to areas where wet processes are used.)</p> <p>Determine whether the installation has areas where wet processes are used.</p> <p>Verify that in such areas:</p> <ul style="list-style-type: none"> <li>- drainage is maintained</li> <li>- false floors, platforms, mats, or other dry standing places are provided, where practicable.</li> </ul> <p>Verify that the installation provides appropriate waterproof footwear in areas where the above actions are not practicable.</p> <p>Verify that floors, working places, and passageways are kept free from:</p> <ul style="list-style-type: none"> <li>- protruding nails</li> <li>- splinters</li> <li>- loose boards</li> <li>- unnecessary holes and openings.</li> </ul>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>GENERAL</b></p> <p><b>SN.20</b> <b>Waste Disposal</b></p> <p><b>SN.20.1.</b> Receptacles used for putrescible solid or liquid waste or refuse must meet certain requirements (29 CFR 1910.141(a)(4)(i)).</p> <p><b>SN.20.2.</b> All sweepings, solid or liquid wastes, refuse, and garbage must be properly removed (29 CFR 1910.141(a)(4)(ii)).</p>	<p>Verify that such receptacles are constructed so that they do not leak and may be thoroughly cleaned and maintained in a sanitary condition.</p> <p>Verify that such receptacles are equipped with solid tight-fitting covers.</p> <p>(NOTE: If sanitary conditions can be maintained without the use of a cover, receptacles need not have covers.)</p> <p>(NOTE: The requirements of this checklist item do not prohibit the use of receptacles that are designed to permit the maintenance of a sanitary condition without regard to the aforementioned requirements.)</p> <p>Verify that such wastes are removed:</p> <ul style="list-style-type: none"> <li>- in a manner that avoids creating a menace to health</li> <li>- as often as necessary or appropriate to maintain the place of employment in a sanitary condition.</li> </ul>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>GENERAL</b></p> <p><b>SN.30</b> <b>Vermin Control</b></p> <p><b>SN.30.1.</b> The installation's enclosed workspaces must be so constructed, equipped, and maintained as to prevent the entrance or harborage of rodents, insects, and other vermin (29 CFR 1910.141(a)(5)).</p>	<p>Verify that, so far as reasonably practicable, enclosed workspaces are so constructed, equipped, and maintained as to prevent the entrance or harborage of rodents, insects, and other vermin.</p> <p>Verify that, where the presence of such creatures is detected, a continuing and effective extermination program is instituted.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>WATER SUPPLY</b></p> <p><b>SN.40</b> <b>Potable Water</b></p> <p><b>SN.40.1.</b> The installation must provide potable water in all places of employment (29 CFR 1910.141(b)(1)(i)).</p> <p><b>SN.40.2.</b> Portable drinking water dispensers must meet specific criteria (29 CFR 1910.141(b)(1)(iii)).</p> <p><b>SN.40.3.</b> Open containers must not be used for dispensing potable water (29 CFR 1910.141 (b)(1)(v)).</p> <p><b>SN.40.4.</b> Common drinking cups and other utensils are prohibited (29 CFR 1910.141(b)(1)(vi)).</p>	<p>Verify that potable water is available in all places of employment for the following:</p> <ul style="list-style-type: none"> <li>- drinking</li> <li>- washing of the person</li> <li>- cooking</li> <li>- washing of foods</li> <li>- washing of cooking or eating utensils</li> <li>- washing of food preparation or processing premises</li> <li>- personal service rooms.</li> </ul> <p>Verify that portable drinking water dispensers are designed, constructed, and serviced so that sanitary conditions are maintained.</p> <p>Verify that portable drinking water dispensers are equipped with a tap and are capable of being closed.</p> <p>Verify that open containers (such as barrels, pails, or tanks) from which water must be dipped or poured are not used for dispensing potable water.</p> <p>(NOTE: This requirement applies to all such containers, whether or not they are fitted with a cover.)</p> <p>Verify that common drinking cups and other common utensils are not in use.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>WATER SUPPLY</b></p> <p><b>SN.50</b> <b>Nonpotable Water</b></p> <p><b>SN.50.1.</b> Outlets for non-potable water must be clearly marked as such (29 CFR 1910.141(b)(2)(i)).</p> <p><b>SN.50.2.</b> Nonpotable water must not be used for certain purposes (29 CFR 1910.141(b)(2)(iii)).</p> <p><b>SN.50.3.</b> Nonpotable water systems and systems that carry any other nonpotable substance must be so constructed as to prevent back-flow or backsiphonage (29 CFR 1910.141(b)(2)(ii)).</p>	<p>Verify that outlets for nonpotable water are posted or otherwise marked in a manner that indicates clearly that the water is unsafe and is not to be used for:</p> <ul style="list-style-type: none"> <li>- drinking</li> <li>- washing of the person</li> <li>- cooking</li> <li>- washing of food</li> <li>- washing of cooking or eating utensils</li> <li>- washing of food preparation or processing premises</li> <li>- personal service rooms</li> <li>- washing clothes.</li> </ul> <p>Verify that nonpotable water is not used for:</p> <ul style="list-style-type: none"> <li>- washing any portion of the person</li> <li>- washing of cooking or eating utensils</li> <li>- washing clothes.</li> </ul> <p>(NOTE: Nonpotable water may be used for cleaning work premises, other than food processing and preparation premises and personal service rooms, <i>provided</i> that the water does not contain concentrations of chemicals, fecal coliform, or other substances that could create unsanitary conditions or be harmful to employees.)</p> <p>Verify that nonpotable water systems or systems carrying any other nonpotable substance are so constructed as to prevent backflow or backsiphonage into a potable water system.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.60</b>  <b>TOILET FACILITIES</b></p> <p><b>SN.60.1.</b> Installations must provide toilet facilities in all places of employment (29 CFR 1910.141(c)(1)(i) and (c)(1)(ii)).</p> <p><b>SN.60.2.</b> Sewage disposal methods must not endanger the health of employees (29 CFR 1910.141(c)(1)(iii)).</p> <p><b>SN.60.3.</b> Water closets must meet certain construction standards (29 CFR 1910.141(c)(2)).</p>	<p>Verify that toilet facilities are provided in all places of employment in accordance with Appendix 32-1.</p> <p>Verify that toilet facilities are contained in toilet rooms separate for each sex.</p> <p>(NOTE: Separate toilet rooms for each sex need not be provided if the toilet room:</p> <ul style="list-style-type: none"> <li>- will be occupied by no more than one person at a time</li> <li>- can be locked from the inside</li> <li>- contains at least one water closet.)</li> </ul> <p>(NOTE: These requirements do not apply to mobile crews or to normally unattended work locations provided that employees at these locations have transportation immediately available to nearby toilet facilities which meet the other requirements of 29 CFR 1910.141(c).)</p> <p>Verify that sewage disposal methods for toilet facilities do not endanger the health of employees.</p> <p>Verify that each water closet occupies a separate compartment with a door and walls or partitions between fixtures sufficiently high to assure privacy.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.70</b>  <b>WASHING</b>  <b>FACILITIES</b></p> <p><b>SN.70.1.</b> Washing facilities must be maintained in a sanitary condition (29 CFR 1910.141(d)(1)).</p> <p><b>SN.70.2.</b> Lavatories must be made available in all places of employment (29 CFR 1910.141 (d)(2)(i)).</p> <p><b>SN.70.3.</b> Lavatories must be provided with specific facilities and equipment (29 CFR 1910.141(d)(2)(ii) through (d)(2)(iv)).</p> <p><b>SN.70.4.</b> Installations must provide showers for employees required to shower during the same shift (29 CFR 1910.141(d)(3)(ii)).</p> <p><b>SN.70.5.</b> Showers must be provided with appropriate cleansing agents (29 CFR 1910.141(d)(3)(iii)).</p> <p><b>SN.70.6.</b> Showers must have hot and cold water feeding a common discharge line (29 CFR 1910.141(d)(3)(iv)).</p>	<p>(NOTE: The shower requirements of SN.70.4 through SN.70.7 apply whenever showers are required by a particular OSHA standard.)</p> <p>Verify that washing facilities are maintained in a sanitary condition.</p> <p>Verify that lavatories are made available to personnel in all places of employment.</p> <p>(NOTE: This requirement does not apply to mobile crews or to normally unattended work locations if employees at these locations have transportation readily available to nearby washing facilities which meet the other requirements of 29 CFR 1910.141(d).)</p> <p>Verify that each lavatory has hot and cold running water, or tepid running water.</p> <p>Verify that each lavatory is provided with:</p> <ul style="list-style-type: none"> <li>- hand soap or similar cleansing agents</li> <li>- individual hand towels (or sections thereof) of cloth or paper, or warm air blowers, or clean individual sections of continuous cloth toweling.</li> </ul> <p>Verify that such items are located convenient to the lavatory.</p> <p>Verify that one shower is provided for each 10 employees of each sex, or numerical fraction thereof, who are required to shower during the same shift.</p> <p>Verify that showers are provided with body soap or other appropriate cleansing agents convenient to the showers.</p> <p>Verify that showers have hot and cold water feeding a common discharge line.</p>

<b>COMPLIANCE CATEGORY:</b> <b>EOH: SANITATION</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>SN.70.7.</b> Individual clean towels must be provided to employees who use showers (29 CFR 1910.141(d)(3)(v)).	Verify that individual clean towels are provided to employees who use installation showers.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.80</b>  <b>CHANGE ROOMS</b></p> <p><b>SN.80.1.</b> Installations must provide change rooms for employees required to wear protective clothing (29 CFR 1910.141(e)).</p>	<p>Verify that change rooms are provided for employees required to wear protective clothing because of the possibility of contamination with toxic materials.</p> <p>Verify that change rooms are equipped with storage facilities for street clothes and separate storage facilities for the protective clothing.</p> <p>(NOTE: These requirements apply whenever employees are required by a particular OSHA standard to wear protective clothing because of the possibility of contamination with toxic materials.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.90</b>  <b>CLOTHES DRYING  FACILITIES</b></p> <p><b>SN.90.1.</b> Working clothes provided by the installation that become wet or are washed between shifts must be dried before reuse (29 CFR 1910.141(f)).</p>	<p>Verify that provisions are made to dry working clothes provided by the installation that become wet or are washed between shifts.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.100</b>  <b>CONSUMPTION OF FOOD AND BEVERAGES ON THE PREMISES</b></p> <p><b>SN.100.1.</b> Consumption and storage of food or beverages is prohibited (29 CFR 1910.141(g)(2) and (g)(4)).</p> <p><b>SN.100.2.</b> Receptacles for waste food must meet certain construction and maintenance requirements (29 CFR 1910.141(g)(3)).</p>	<p>(NOTE: These requirements apply only where employees are permitted to consume food or beverages, or both, on the premises.)</p> <p>Verify that neither consumption nor storage of food and beverages occurs in toilet rooms and areas exposed to toxic materials.</p> <p>Verify that receptacles for waste food are constructed of smooth, corrosion resistant, easily cleanable, or disposable materials.</p> <p>Verify that the number, size, and location of such receptacles encourages their use and does not result in overfilling.</p> <p>Verify that such receptacles are emptied at least once each working day and maintained in a clean and sanitary condition.</p> <p>(NOTE: Receptacles need not be emptied if they are unused.)</p> <p>Verify that receptacles are provided with a solid, tight-fitting cover.</p> <p>NOTE: If sanitary conditions can be maintained without the use of a cover, receptacles need not have covers.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SN.110 FOOD HANDLING</b></p> <p><b>SN.110.1.</b> Employee food service facilities and operations must use sound hygienic principles (29 CFR 1910.141(h)).</p>	<p>Verify that employee food service facilities and operations are carried out in accordance with sound hygienic principles.</p> <p>Verify that, in all places where all or part of the food service is provided, the food dispensed is wholesome and free from spoilage.</p> <p>Verify that food dispensed is processed, prepared, handled, and stored in such a manner as to be protected against contamination.</p>



### Appendix 32-1

#### Number of Water Closets Required for Installations (29 CFR 1910.141, Table J-1)

Number of Employees	Minimum Number of Water Closets <sup>1</sup>
1 to 15	1
16 to 35	2
36 to 55	3
56 to 80	4
81 to 110	5
111 to 150	6
Over 150	( <sup>2</sup> )

<sup>1</sup> Where toilet facilities will not be used by women, urinals may be provided instead of water closets, provided that the number of water closets in such cases is not reduced to less than two-thirds of the minimum specified.

<sup>2</sup> One additional fixture for each 40 employees.

(NOTE: Where lockable single-occupancy toilet rooms have more than one toilet facility, only one such facility in each toilet room may be counted for the purpose of this table.)



## **CHAPTER 33**

### **PERMIT-REQUIRED CONFINED SPACES**

## CHAPTER 33

### EOH: PERMIT-REQUIRED CONFINED SPACES

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Acceptable Entry Conditions* - the conditions that must exist in a permit space to allow entry and to ensure that personnel involved with a permit-required confined space entry can safely enter into and work within the space (29 CFR 1910.146(b)).
- *Authorized Entrant* - an individual who is authorized by the installation to enter a permit space (29 CFR 1910.146(b)).
- *Blanking or Blinding* - the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate (29 CFR 1910.146(b)).
- *Confined Space* - a space that: (29 CFR 1910.146(b))
  1. is large enough and so configured that an individual can bodily enter and perform assigned work
  2. has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits)
  3. is not designed for continuous personnel occupancy.
- *Double Block and Bleed* - the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves (29 CFR 1910.146(b)).
- *Emergency* - any occurrence, including any failure of hazard control or monitoring equipment, or event internal or external to the permit space that could endanger entrants (29 CFR 1910.146(b)).
- *Entry* - the action by which a person passes through an opening into a permit-required confined space. This includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space (29 CFR 1910.146(b)).
- *Entry Permit* - the written or printed document that the installation provides to allow and control entry into a permit space and that contains the information specified in 29 CFR 1910.146(f) (29 CFR 1910.146(b)).
- *Hazardous Atmosphere* - an atmosphere that may expose personnel to the risk of death, incapacitation, impairment of the ability to self-rescue (i.e., escape unaided from a permit space), injury, or acute illness from one or more of the following causes (29 CFR 1910.146(b)):
  1. flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL)
  2. airborne combustible dust at a concentration that meets or exceeds its LFL  
(NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 ft (1.52 m) or less.)
  3. atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
  4. atmospheric concentration of any substance for which a dose or a OEL is published in 29 CFR 1910 Subpart G, *Occupational Health and Environmental Control*, or in 29 CFR 1910 Subpart Z, *Toxic and Hazardous Substances*, and which could result in personnel exposure in excess of its dose or OEL

(NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.)

5. any other atmospheric condition that is immediately dangerous to life or health.

(NOTE: For air contaminants for which OSHA has not determined a dose or OEL, other sources of information, including the MSDSs that meet 1910.1200, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.)

- *Immediately Dangerous to Life or Health (IDLH)* - with respect to permit-required, confined space entry, any condition that poses an immediate or delayed threat to life or that would cause irreversible, adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space (29 CFR 1910.146(b)).

(NOTE: Some materials (e.g., hydrogen fluoride gas and cadmium vapor) may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12 to 72 h after exposure. The victim feels normal from recovery from transient effects until such collapse. Such materials in hazardous quantities are considered to be immediately dangerous to life or health.)

(NOTE: AFOSH STD 48-1 defines IDLH as any condition that poses an immediate or delayed threat to life or that would cause irreversible, adverse health effects or that would interfere with an individual's ability to escape unaided from a contaminated area (AFOSH STD 48-1, Attachment 1, Section C).)

- *Isolation* - the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as (29 CFR 1910.146(b)):
  1. blanking or blinding
  2. misaligning or removing sections of lines, pipes, or ducts
  3. a double block and bleed system
  4. lockout or tagout of all sources of energy
  5. blocking or disconnecting all mechanical linkages.
- *Nonpermit Confined Space* - a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm (29 CFR 1910.146(b)).
- *Permit* - see *Entry Permit*.
- *Permit-Required, Confined Space (Permit Space)* - a confined space that has one or more of the following characteristics (29 CFR 1910.146(b)):
  1. contains or has a potential to contain a hazardous atmosphere
  2. contains a material that has the potential for engulfing an entrant
  3. has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section
  4. contains any other recognized serious safety or health hazard.
- *Permit-Required, Confined Space Program* - the installation's overall program for controlling and, where appropriate, protecting personnel from permit space hazards and for regulating personnel entry into permit spaces (29 CFR 1910.146(b)).
- *Rescue Service* - the personnel designated to rescue personnel from permit spaces (29 CFR 1910.146 (b)).
- *Testing* - the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

(NOTE: Testing enables installations both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to and during entry (29 CFR 1910.146(b)).)



## **EOH: PERMIT-REQUIRED CONFINED SPACES**

### **GUIDANCE FOR CHECKLIST USERS**

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	CS.10.1 through CS.10.4	33-7
Permit-Required Confined Space Program (Permit Space Program)	CS.20.1 and CS.20.2	33-9
Personnel Training	CS.30.1 through CS.30.3	33-11
Rescue and Emergency Supervisors	CS.40.1 and CS.40.2	33-13

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**COMPLIANCE CATEGORY:**  
**EOH: PERMIT-REQUIRED CONFINED SPACES**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CS.10 GENERAL REQUIREMENTS</b></p> <p><b>CS.10.1.</b> Installations must evaluate the workplace to determine whether any spaces are permit-required confined spaces (29 CFR 1910.146(c)(1)).</p> <p><b>CS.10.2.</b> Installations must re-evaluate any non-permit-required spaces whenever there are changes in their use or configuration (29 CFR 1910.146(c)(6)).</p> <p><b>CS.10.3.</b> Installations must follow specific procedures to reclassify a permit-required space as non-permit-required (29 CFR 1910.146(c)(7)).</p>	<p>Verify that the installation has evaluated its workplaces to determine whether any spaces are permit-required confined spaces.</p> <p>(NOTE: Proper application of the decision flowchart in Appendix A to 29 CFR 1910.146 may facilitate compliance with this requirement.)</p> <p>Verify that the installation evaluates any nonpermit-required space whenever there are changes in the use or configuration of the space.</p> <p>Verify that, if necessary, the installation reclassifies such a space as a permit-required space.</p> <p>Verify that, if the installation reclassifies a permit-required space as nonpermit-required, the permit space poses no actual or potential atmospheric hazards and that all hazards within the space are eliminated without entry into the space.</p> <p>Verify that, if it is necessary to enter the permit space to eliminate hazards, such entry is performed according to the requirements of 29 CFR 1910.146(d) through (k) (see the checklist items in CS.20 through CS.40 in this Part and checklist items PS.10.7 through PS.10.36 in Part II, <i>Safety</i>).</p> <p>(NOTE: If testing and inspection during entry demonstrates that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit-required space for as long as the hazards remain eliminated.)</p> <p>(NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. 29 CFR 1910.146(c)(5) covers permit space entry where the installation can demonstrate that forced air ventilation alone will control all hazards in the space.)</p> <p>Verify that the installation documents the basis for determining that all hazards in the permit space have been eliminated through a written certification that includes:</p> <ul style="list-style-type: none"> <li>- the date</li> <li>- the location of the space</li> <li>- the signature of the person making the determination.</li> </ul>

<b>COMPLIANCE CATEGORY:</b> <b>EOH: PERMIT-REQUIRED CONFINED SPACES</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>CS.10.4.</b> Installations must meet specific requirements with regard to contractors whose work requires them to enter permit spaces (29 CFR 1910.146(c)(8) and AFI 91-301, para 9).</p>	<p>Verify that such certification is made available to each individual entering the space.</p> <p>Verify that, if hazards arise within a permit space that has been declassified to a non permit-required space:</p> <ul style="list-style-type: none"> <li>- each individual exits the space</li> <li>- the installation re-evaluates the space and determines whether it should be classified as a permit-required space.</li> </ul> <p>Determine whether the installation uses contractors to perform work that involves permit space entry.</p> <p>Verify that the installation does the following:</p> <ul style="list-style-type: none"> <li>- informs the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program that meets the requirements of 29 CFR 1910.146</li> <li>- apprises the contractor of the elements, including the hazards identified and the installation's experience with the space, that make the space a permit space</li> <li>- apprises the contractor of any precautions or procedures that the installation has implemented for the protection of personnel in or near permit spaces where contractor personnel will be working</li> <li>- coordinates entry operations with the contractor, when both installation personnel and contractor personnel will be working in or near permit spaces</li> <li>- debriefs the contractor at the conclusion of the entry operations regarding: <ul style="list-style-type: none"> <li>- the permit space program</li> <li>- any hazards confronted or created in permit spaces during entry operations.</li> </ul> </li> </ul> <p>(NOTE: Contractors are solely responsible for compliance with OSHA standards. Air Force safety, fire protection, and BE officials do not have the authority to direct contractor activities unless a condition exists which presents imminent danger to Air Force personnel.)</p> <p>(NOTE: 29 CFR 1910.146(c)(9) outlines the responsibilities of contractors with regard to permit space entry.)</p>

**COMPLIANCE CATEGORY:**  
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**REGULATORY REQUIREMENTS:**

**REVIEWER CHECKS:**  
September 1997

**CS.20**  
**PERMIT REQUIRED**  
**CONFINED SPACE**  
**PROGRAM (PERMIT**  
**SPACE PROGRAM)**

**CS.20.1.** Installations must evaluate permit space conditions before and during entry operations (29 CFR 1910.146(d)(5)).

Verify that the installation tests conditions in the permit space to determine if acceptable entry conditions exist before authorization is given to begin entry.

- performs testing to the extent feasible before entry is authorized
- monitors continuously in areas where authorized entrants are working, after entry has been authorized.

Verify that, when testing for atmospheric hazards, the installation tests for conditions in the following order:

- (NOTE: Atmospheric testing conducted in accordance with Appendix B to 29 CFR 1910.146 would satisfy the testing requirements. For permit space operations in sewers, atmospheric testing conducted in accordance with Appendices B and E to 29 CFR 1910.146 would satisfy the requirements.)

**CS.20.2.** Installations must review and revise entry operations when necessary (29 CFR 1910.146(d)(13) and (d)(14)).

Verify that, if the review reveals that deficiencies exist, the installation revises the program to correct such deficiencies before subsequent entries take place.

<b>COMPLIANCE CATEGORY:</b> <b>EOH: PERMIT-REQUIRED CONFINED SPACES</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
	<p>(NOTE: The following are examples of circumstances that require an installation to review the permit entry program:</p> <ul style="list-style-type: none"> <li>- any unauthorized entry of a permit space</li> <li>- the detection of a permit space hazard not covered by the permit</li> <li>- the detection of a condition prohibited by the permit</li> <li>- the occurrence of an injury or near-miss during entry</li> <li>- a change in the use or configuration of a permit space</li> <li>- personnel complaints about the effectiveness of the program.)</li> </ul> <p>Verify that the installation reviews and, if necessary, revises its permit space program within 1 yr of each entry.</p> <p>(NOTE: The installation may conduct a single annual review covering all entries performed during a 12-mo period. If no entry is performed during a 12-mo period, no review is necessary.)</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CS.30</b>  <b>PERSONNEL TRAINING</b></p> <p><b>CS.30.1.</b> Installations must provide training to all affected personnel (29 CFR 1910.146(g)(1) and (g)(2)).</p> <p><b>CS.30.2.</b> Training must establish personnel proficiency in required duties and provide instruction about new or revised procedures (29 CFR 1910.146(g)(3)).</p> <p><b>CS.30.3.</b> Installations must certify that affected personnel have received training (29 CFR 1910.146(g)(4)).</p>	<p>Verify that the installation provides training to each affected individual:</p> <ul style="list-style-type: none"> <li>- before he/she is first assigned duties regulated by 29 CFR 1910.146</li> <li>- before there is a change in assigned duties</li> <li>- whenever there is a change in permit space operations that presents a hazard about which the individual has not received training</li> <li>- whenever the installation has reason to believe that either: <ul style="list-style-type: none"> <li>- there have been deviations from the permit space entry procedures, or</li> <li>- there are inadequacies in the individual's knowledge or use of permit space entry procedures.</li> </ul> </li> </ul> <p>Verify that training establishes the proficiency of affected personnel in their required duties and instructs them in any new or revised procedures.</p> <p>Verify that the installation provides certification that training has been accomplished.</p> <p>Verify that such certification includes:</p> <ul style="list-style-type: none"> <li>- each individual's name</li> <li>- the signatures or initials of the trainers</li> <li>- dates of training.</li> </ul> <p>Verify that the installation makes training certification available to affected personnel or their authorized representatives for inspection.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CS.40 RESCUE AND EMERGENCY SUPERVISORS</b></p> <p><b>CS.40.1.</b> Installations must ensure that each member of the rescue service is provided with, and is trained to use properly, the PPE and rescue equipment necessary for making rescues from permit spaces (29 CFR 1910.146(k)(1)(i)).</p> <p><b>CS.40.2.</b> MSDSs or written information must be made available to medical facilities treating exposed entrants (29 CFR 1910.146(k)(4)).</p>	<p>(NOTE: The rescue and emergency supervisor requirements of 29 CFR 1910.146(k) (see the checklist items in CS.40 in this Part and PS.10.31 through PS.10.36 in Part II, <i>Safety</i>) apply to installations that have personnel enter permit spaces to perform rescue services.)</p> <p>Verify that each member of the rescue service is provided with, and is trained to use properly, the PPE and rescue equipment necessary for making rescues from permit spaces.</p> <p>Verify that, if an injured entrant is exposed to a substance for which an MSDS or other similar written information is required to be kept at the worksite, the MSDS or written information is made available to the medical facility treating the exposed entrant.</p>



## **CHAPTER 34**

### **ERGONOMICS**

**CHAPTER 34**  
**EOH: ERGONOMICS**  
**ECAMP-ANG**

**September 1997**

**Applicability**

The requirements in this chapter do not take effect until January 1998.

**Compliance Definitions**

(NOTE: The DOD Memorandum, *Ergonomics Program Requirements*, 4 February 1997, is cited as 'DOD Ergonomics Memorandum.')

- *Ergonomics* - the field of study that seeks to fit the job to the person, rather than the person to the job. This is achieved by the evaluation and design of workplaces, environments, jobs, tasks, equipment, and processes in relationship to human capabilities and interactions (DOD Ergonomics Memorandum, Encl. 1).
- *Systematic Passive Surveillance* - surveillance that includes analyzing data provided in existing reports and data sources such as the following: (DOD Ergonomics Memorandum, para. 2)
  - routine injury and illness reports
  - log and summary of occupational injuries and illnesses
  - *Federal Employees Compensation Act* (FECA) claims
  - medical and safety records
  - workforce reports
  - employee complaints
  - hazard reports
  - installation hazard abatement logs
  - suggestions.
- *Workplace Risk Factors (Ergonomics)* - actions in the workplace, workplace conditions, or a combination thereof, that may cause or aggravate a work-related musculoskeletal disorder. Workplace risk factors include, but are not limited to:
  1. repetitive, forceful, or prolonged exertions
  2. frequent or heavy lifting
  3. pushing, pulling, or carrying of heavy objects
  4. a fixed or awkward work posture, contact stress
  5. localized or whole-body vibration, cold temperatures, and poor lighting (leading to awkward postures).These workplace risk factors can be intensified by work organization characteristics such as inadequate work-rest cycles, excessive work pace and/or duration, unaccustomed work, lack of task variability, machine work, and piece rate (DOD Ergonomics Memorandum, Encl. 1).
- *Work-Related Musculoskeletal Disorder (Ergonomics)* - an injury or illness of the muscles, tendons, ligaments, peripheral nerves, joints, cartilage (including intervertebral discs), bones, and/or supporting blood vessels in either the upper or lower extremities, back, or neck, that is associated with musculoskeletal disorder workplace risk factors and is not limited to cumulative trauma disorders, repetitive strain injuries or illnesses. Refers collectively to signs, or persistent symptoms, or clinically-diagnosed work-related musculoskeletal disorders when they are caused or aggravated by exposure to workplace risk factors (DOD Ergonomics Memorandum, Encl. 1).



## EOH: ERGONOMICS

### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
General Requirements	EG.10.1 through EG.10.6	34-5
Appendix 34-1, <i>Air Force Ergonomic Resources</i>		34-7
Appendix 34-2, <i>Resources for Special Ergonomics Issues</i>		34-9



**COMPLIANCE CATEGORY:**  
**EOH: ERGONOMICS**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>EG.10 GENERAL REQUIREMENTS</b></p> <p><b>EG.10.1.</b> Installations must prepare a written plan for a comprehensive ergonomics program that meets specific requirements (DOD Ergonomics Memorandum, para. 1).</p> <p><b>EG.10.2.</b> Installations must perform workplace analysis (DOD Ergonomics Memorandum, para. 2).</p>	<p>Verify that the installation prepares a written plan for a comprehensive ergonomics program.</p> <p>Verify that such a program includes, at a minimum, the following:</p> <ul style="list-style-type: none"> <li>- goals and objectives</li> <li>- program interface with existing programs</li> <li>- the four critical elements for ergonomic intervention <ul style="list-style-type: none"> <li>- workplace analysis</li> <li>- hazard prevention and control</li> <li>- health care management</li> <li>- education and training.</li> </ul> </li> </ul> <p>(NOTE: The degree of emphasis in each critical element will vary according to the hazards and concerns at each installation.)</p> <p>Verify that systematic passive surveillance is used to identify work-related musculoskeletal disorders.</p> <p>Determine whether there is convincing evidence that musculoskeletal hazards exist.</p> <p>Verify that, where such hazards exist, active surveillance is used to identify, evaluate, and manage workplace risks.</p> <p>Verify that musculoskeletal disorders are evaluated for all of the following:</p> <ul style="list-style-type: none"> <li>- to determine occupational risk factors</li> <li>- to determine potential work relatedness</li> <li>- to identify other workers potentially at risk.</li> </ul> <p>Verify that health and safety staff use DOD resources (see Appendix 34-2) for assistance in evaluating risk factors and reducing work related musculoskeletal disorders</p> <p>Verify that, during safety inspections and industrial hygiene surveys, health and safety staff:</p> <ul style="list-style-type: none"> <li>- look for ergonomic risk factors</li> <li>- identify the need for more detailed analysis and intervention.</li> </ul>

**COMPLIANCE CATEGORY:**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>EG.10.3.</b> Installations must prevent and control exposure to ergonomic hazards (DOD Ergonomics Memorandum, para. 3).</p>	<p>(NOTE: Effective design or redesign of a task or workstation is the preferred method of preventing and controlling exposure.)</p> <p>Verify that the methods of intervention (in order of priority) used are:</p> <ul style="list-style-type: none"> <li>- process elimination</li> <li>- engineering controls</li> <li>- substitution</li> <li>- work practices</li> <li>- administrative controls (e.g., adjustment of work-rest cycles, slowing work pace, task rotation).</li> </ul> <p>(NOTE: The DOD does not recognize back support belts or wrist splints as personal protective equipment (PPE), or support the use of these devices in the prevention of back or wrist injuries. These devices are considered medical appliances, and may be prescribed by a credentialed health care provider who will assume responsibility for medical clearance, proper fit of the device, and treatment monitoring and supervision.)</p> <p>Verify that all ergonomic hazards are assigned a risk assessment code (RAC) using the RAC scoring system and entered in to the installation hazard abatement plan as outline in DODI 6055.1, <i>DOD Occupational Safety and Health Program</i> (see also Chapter 14, Basic Program Elements).</p>
<p><b>EG.10.4.</b> Installations must write health care management protocols for certain employees in accordance with AF guidance (DOD Ergonomics Memorandum, para. 4).</p>	<p>Verify that the installation uses AF guidance to develop written health care management protocols for employees with work-related musculoskeletal disorders.</p>
<p><b>EG.10.5.</b> Installations must develop and implement ergonomic education and training programs in accordance with AF guidance (DOD Ergonomics Memorandum, para. 5).</p>	<p>Verify that the installation develops ergonomic education and training programs in accordance with AF guidance.</p>
<p><b>EG.10.6.</b> Installations should evaluate and review ergonomic programs (MP).</p>	<p>Verify that the installation evaluates the ongoing ergonomic effort to measure the effectiveness of interventions and level of participation.</p>

**Appendix 34-1**  
**Air Force Ergonomic Resources**  
(DOD Ergonomics Memorandum, Encl. 2-1)

**Policy/Plan**

NONE

**Technical Guidance**

*Preventing Musculoskeletal Illnesses Through Ergonomics: The Premier Program*

- Vol. 1: Management Guidelines
- Vol. 2: Job Requirements/ Physical Demands Survey
- Vol. 3: Level I Ergonomic Assessment Methodology Guide for Administrative Work Areas
- Vol. 4: Level I Ergonomic Assessment Methodology Guide for Maintenance and Inspection Areas

**Informational Publications/ Materials**

- a. Information Documents
- b. ErgoEaser computer program (Education module)

**Worksite Assessment Services**

- a. On-site surveys
- b. Contractor interface
- c. Telephone consultations

**Training\***

- a. Training on a variety of ergonomics-related topics
- b. Introductory 40-hr course
- c. advanced specialized 40-hr courses:
  - Bioenvironmental Engineering
  - Public Health (with Army)

**Points of Contact**

Armstrong Laboratories  
Ergonomics Program  
DSN 240-6120  
Commercial (512) 536-6120

\* Check the DOD Safety and Occupational Health (SOH) Training Inventory on DENIX for course details.



## **Appendix 34-2**

### **Resources for Special Ergonomic Issues** (DOD Ergonomics Memorandum, Encl. 2-2)

#### **Purchasing, Accommodation, Tools, Furniture:**

- a. General Services Administration, Tools and Appliances Commodity Center  
POC: Mr. Stan Fjoser, DSN 465-7520 or commercial (816) 926-7520
- b. Clearinghouse on Computer Accommodation  
POC: Ms. Marilyn Estep, (202) 501-3322

#### **Federal Sector Partnerships**

- a. DOE -- ErgoEaser computer program, information exchange - program issues
- b. OSHA -- Policy and program issues, information exchange
- c. NIOSH-- Research and program issues, information exchange



## **CHAPTER 35**

### **GENERAL CONSTRUCTION CONCERNS**

## **CHAPTER 35**

### **EOH: GENERAL CONSTRUCTION CONCERNS**

#### **ECAMP-ANG**

**September 1997**

#### **Applicability**

This chapter applies to construction work, which is work for construction, alteration and/or repair, and which includes painting and decorating.

#### **Compliance Definitions**

- NONE



**EOH: GENERAL CONSTRUCTION CONCERNS**

**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	CG.10.1 through CG.10.12	35-5
Appendix 35-1, <i>Minimum Illumination Intensities in Foot-Candles</i>		35-9



**COMPLIANCE CATEGORY:**  
**EOH: GENERAL CONSTRUCTION CONCERNS**  
**U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2**

<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CG.10 GENERAL REQUIREMENTS</b></p> <p><b>CG.10.1.</b> Employees required to handle or use poisons, caustics, and other harmful substances must be trained (29 CFR 1926.21(b)(3)).</p> <p><b>CG.10.2.</b> Certain employees in job sites where harmful plants or animals are present must be trained (29 CFR 1926.21(b)(4)).</p> <p><b>CG.10.3.</b> Appropriate containers that must be provided for certain uses and must be managed properly (29 CFR 1926.25(c)).</p> <p><b>CG.10.4.</b> Specific requirements must be met with regard to the provision of potable water (29 CFR 1926.51(a)).</p>	<p>Verify that employees who are required to handle or use poisons, caustics, and other harmful substances are instructed in the safe handling and use of the materials.</p> <p>Verify that employees who are required to handle or use poisons, caustics, and other harmful substances are made aware of the potential hazards, personal hygiene, and personal protective measures required.</p> <p>Determine whether there are employees in job sites where harmful plants or animals are present who may be exposed to those plants or animals.</p> <p>Verify that such employees are instructed regarding the following:</p> <ul style="list-style-type: none"> <li>- the potential hazards</li> <li>- how to avoid injury</li> <li>- first aid procedures to be used in the event of injury.</li> </ul> <p>Verify that containers are provided for the collection and separation of the following:</p> <ul style="list-style-type: none"> <li>- waste</li> <li>- trash</li> <li>- oily and used rags</li> <li>- other refuse.</li> </ul> <p>Verify that containers used for the following are equipped with covers:</p> <ul style="list-style-type: none"> <li>- garbage</li> <li>- oily, flammable, or hazardous wastes (such as caustics, acids, harmful dusts).</li> </ul> <p>Verify that garbage and other waste is disposed of at frequent and regular intervals.</p> <p>Verify that an adequate supply of potable water is provided.</p> <p>Verify that portable containers used to dispense drinking water are capable of being tightly closed.</p>

**COMPLIANCE CATEGORY:**  
**EOH: GENERAL CONSTRUCTION CONCERNS**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CG.10.5.</b> Outlets for non-potable water must be identified by signs (29 CFR 1926.51(b)(1)).</p> <p><b>CG.10.6.</b> No cross-connections are permitted between a system that furnishes potable water and one that furnishes nonpotable water (29 CFR 1926.51(b)(1)).</p> <p><b>CG.10.7.</b> At least one toilet must available under temporary field conditions provided at construction job sites (29 CFR 1926.51(b)(2)).</p> <p><b>CG.10.8.</b> Adequate washing facilities must be provided for employees engaged in certain activities (29 CFR 1926.51(f)(1)).</p> <p><b>CG.10.9.</b> Employees must not be allowed to consume food or beverages in a toilet room or in any area exposed to toxic materials (29 CFR 1926.51(g)).</p>	<p>Verify that portable containers used to dispense drinking water are provided with a tap.</p> <p>Verify that any container used to distribute drinking water is clearly marked as to the nature of its contents and not used for any other purpose.</p> <p>Verify that single-use cups are used for drinking.</p> <p>Verify that both a sanitary container for the unused cups and a receptacle for disposing of the used cups are provided.</p> <p>Verify that outlets for nonpotable water are identified by signs that clearly indicate that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.</p> <p>Verify that there is no cross-connection, either open or potential, between a system that furnishes potable water and one that furnishes nonpotable water.</p> <p>Verify that at least one toilet is available under temporary field conditions.</p> <p>Determine whether employees are engaged in the application of paints, coatings, herbicides, or insecticides, or in any other operations where contaminants may be harmful to employees.</p> <p>Verify that adequate washing facilities are provided in near proximity to the work place.</p> <p>Verify that such washing facilities are so equipped as to enable employees to remove such substances.</p> <p>Verify that employees are not allowed to consume food or beverages in a toilet room or in any area exposed to toxic materials.</p>

**COMPLIANCE CATEGORY:**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>CG.10.10.</b> Every enclosed workplace must be so constructed, equipped, and maintained as to prevent the entrance or harborage of rodents, insects, and other vermin (29 CFR 1926.51(h)).</p> <p><b>CG.10.11.</b> Change rooms must be provided under certain circumstances (29 CFR 1926.51(i)).</p> <p><b>CG.10.12.</b> Construction areas, ramps, runways, corridors, offices, shops, and storage areas must be lighted to not less than certain intensities (29 CFR 1926.56(a)).</p>	<p>Verify that every enclosed workplace is so constructed, equipped, and maintained as to prevent the entrance or harborage of rodents, insects, and other vermin.</p> <p>(NOTE: This requirement applies insofar as is reasonably practical.)</p> <p>Verify that a continuing and effective extermination program is instituted where the presence of such vermin is detected.</p> <p>Determine whether employees are required by a particular standard to wear protective clothing because of the possibility of contamination with toxic materials.</p> <p>Verify that change rooms are provided for such employees.</p> <p>Verify that the change rooms are equipped with storage facilities for street clothes and separate storage facilities for the protective clothing.</p> <p>Verify that construction areas, ramps, runways, corridors, offices, shops, and storage areas must be lighted to not less than the minimum illumination intensities listed in Appendix 35-1.</p>



## Appendix 35-1

### Minimum Illumination Intensities in Foot-Candles (29 CFR 1926.56, Table D-3)

Foot-candles	Area or operation
5	General construction area lighting
3	General construction areas, concrete placement, excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas
5	Indoors: warehouses, corridors, hallways, and exitways
5	Tunnels, shafts, and general underground work areas: (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling. Bureau of Mines approved cap lights are acceptable for use in the tunnel heading.)
10	General construction plant and shops (e.g., batch plants, screening plants, mechanical and electrical equipment rooms, carpenter shops, rigging lofts and active storerooms, barracks or living quarters, locker or dressing rooms, mess halls, and indoor toilets and workrooms)
30	First aid stations, infirmaries, and offices



## **CHAPTER 36**

### **ASBESTOS -- CONSTRUCTION**

## CHAPTER 36

### EOH: ASBESTOS -- CONSTRUCTION

#### ECAMP-ANG

#### Applicability

The requirements of this chapter regulate asbestos exposure in all construction work (work for construction, alteration and/or repair, including painting and decorating), including but not limited to the following:

1. demolition or salvage of structures where asbestos is present
2. removal or encapsulation of materials containing asbestos
3. construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof that contain asbestos
4. installation of products containing asbestos
5. asbestos spill/emergency cleanup
6. transportation, disposal, storage, containment of and housekeeping activities involving asbestos or products containing asbestos, on the site or location at which construction activities are performed.

Coverage under the requirements of this chapter is based on the nature of the work operation involving asbestos exposure.

#### Compliance Definitions

- *Aggressive Method* - removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact ACM (29 CFR 1926.1101(b)).
- *Amended Water* - water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM (29 CFR 1926.1101(b)).
- *Asbestos* - the term is understood to include chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. For purposes of 29 CFR 1926.1101, *Asbestos* includes PACM, as defined below (29 CFR 1926.1101(b)).
- *Asbestos-Containing Material (ACM)* - any material containing more than 1% asbestos (29 CFR 1926.1101(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1926.1101(b)).
- *Authorized Person* - any person authorized by the employer and required by work duties to be present in regulated areas (29 CFR 1926.1101(b)).
- *Building/Facility Owner* - the legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which activities covered by this chapter take place (29 CFR 1926.1101(b)).
- *Certified Industrial Hygienist (CIH)* - one certified in the practice of industrial hygiene by the American Board of Industrial Hygiene (29 CFR 1926.1101(b)).
- *Class I Asbestos Work* - activities involving the removal of thermal system insulation (TSI) and surfacing ACM and PACM (29 CFR 1926.1101(b)).

- *Class II Asbestos Work* - activities involving the removal of ACM which is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics (29 CFR 1926.1101(b)).
- *Class III Asbestos Work* - repair and maintenance operations, where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed (29 CFR 1926.1101(b)).
- *Class IV Asbestos Work* - maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities (29 CFR 1926.1101(b)).
- *Clean Room* - an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment (29 CFR 1926.1101(b)).
- *Closely Resemble* - when the major workplace conditions which have contributed to the levels of historic asbestos exposure are no more protective than conditions of the current workplace (29 CFR 1926.1101(b)).
- *Competent Person* - (in addition to the definition in 29 CFR 1926.32 (f)), one who:
  1. is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure
  2. has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f)

In addition, for Class I and Class II work, one who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent  
 For Class III and Class IV work, one who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2) (29 CFR 1926.1101(b)).
- *Critical Barrier* - one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area (29 CFR 1926.1101(b)).
- *Decontamination Area* - an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos (29 CFR 1926.1101(b)).
- *Demolition* - the wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products (29 CFR 1926.1101(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee (29 CFR 1926.1101(b)).
- *Disturbance* - activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 in. in length and width (29 CFR 1926.1101(b)).
- *Employee Exposure* - that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment (29 CFR 1926.1101(b)).

- *Equipment Room (Change Room)* - a contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment (29 CFR 1926.1101(b)).
- *Excursion Limit* - an airborne concentration of asbestos equaling 1.0 f/cc as averaged over a sampling period of 30 min (29 CFR 1926.1101(c)(2)).
- *Fiber* - a particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1 (29 CFR 1926.1101(b)).
- *Glovebag* - not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled (29 CFR 1926.1101(b)).
- *High-Efficiency Particulate Air (HEPA) Filter* - a filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter (29 CFR 1926.1101(b)).
- *Homogeneous Area* - an area of surfacing material or thermal system insulation that is uniform in color and texture (29 CFR 1926.1101(b)).
- *Industrial Hygienist* - a professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards (29 CFR 1926.1101(b)).
- *Intact* - that the ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix (29 CFR 1926.1101(b)).
- *Mini-Enclosure* - a small walk-in enclosure which accommodates no more than two persons (29 CFR 1926.1101(g)(5)(vi)).
- *Modification* - (for purposes of 29 CFR 1926.1101(g)(6)(ii) (see checklist item CA.50.12)), a changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system. Omitting a procedure or component, or reducing or diminishing the stringency or strength of a material or component of the control system is not a modification for purposes of 29 CFR 1926.1101(g)(6) (29 CFR 1926.1101(b)).
- *Negative Initial Exposure Assessment* - a demonstration by the employer, which complies with the criteria in 29 CFR 1929.1101(f)(2)(iii) (see checklist item CA.40.3), that employee exposure during an operation is expected to be consistently below the OELs (29 CFR 1926.1101(b)).
- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8 h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).
- *Presumed Asbestos Containing Material (PACM)* - thermal system insulation and surfacing material found in buildings constructed no later than 1980. The designation of a material as PACM may be rebutted pursuant 29 CFR 1929.1101(k)(5) (see checklist item CA.120.5) (29 CFR 1926.1101(b)).

- *Project Designer* - a person who has successfully completed the training requirements for an abatement project designer established by 40 USC § 763.90(g) (29 CFR 1926.1101(b)).
- *Regulated Area* - an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit. Requirements for regulated areas are set out in 29 CFR 1929.1101(e) (see the checklist items in CA.30) (29 CFR 1926.1101(b)).
- *Removal* - all operations where ACM and/or PACM is taken out or stripped from structures or substrates, and includes demolition operations (29 CFR 1926.1101(b)).
- *Renovation* - the modifying of any existing structure, or portion thereof (29 CFR 1926.1101(b)).
- *Repair* - overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates (29 CFR 1926.1101(b)).
- *Surfacing Material* - material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes) (29 CFR 1926.1101(b)).
- *Surfacing ACM* - surfacing material which contains more than 1% asbestos (29 CFR 1926.1101(b)).
- *Thermal System Insulation (TSI)* - ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain (29 CFR 1926.1101(b)).
- *Thermal System Insulation ACM* - thermal system insulation which contains more than 1% asbestos (29 CFR 1926.1101(b)).

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### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
Occupational Exposure Limits (OELs)	CA.10.1	36-7
Multi-Employer Worksites	CA.20.1	36-9
Regulated Areas	CA.30.1 through CA.30.6	36-11
Exposure Assessments and Monitoring	CA.40.1 through CA.40.6	36-13
Methods of Compliance		
Class I Asbestos Work	CA.50.1 through CA.50.12	36-17
Class II Asbestos Work	CA.60.1 through CA.60.7	36-25
Class III Asbestos Work	CA.70.1	36-29
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Competent Persons	CA.160.1 through CA.160.4	36-61

Appendix 36-1, *Respiratory Protection for Asbestos Fibers*

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>CA.10 OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>CA.10.1.</b> Employers must ensure that no employee is exposed to an airborne concentration of asbestos in excess of certain limitations (29 CFR 1926.1101(c)(1) and (c)(2)).</p>	<p>Verify that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 f/cc of air as an 8-h time-weighted average (TWA), as determined by the method prescribed in Appendix A to 29 CFR 1926.1101, or by an equivalent method.</p> <p>Verify that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 f/cc of air as averaged over a sampling period of 30 min, as determined by the method prescribed in Appendix A to 29 CFR 1926.1101, or by an equivalent method.</p>



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<p><b>CA.20</b>  <b>MULTI-EMPLOYER WORKSITES</b></p> <p><b>CA.20.1.</b> An employer must satisfy certain requirements on multi-employer worksites (29 CFR 1926.1101(d)).</p>	<p>Verify that, on multi-employer worksites, an employer performing work requiring the establishment of a regulated area informs other employers on the site of:</p> <ul style="list-style-type: none"> <li>- the nature of the employer's work with asbestos and/or PACM</li> <li>- the existence of and requirements pertaining to regulated areas</li> <li>- the measures taken to ensure that employees of such other employers are not exposed to asbestos.</li> </ul> <p>Verify that asbestos hazards at a multi-employer work site are abated by the contractor who created or controls the source of asbestos contamination.</p> <p>(NOTE: For example, if there is a significant breach of an enclosure containing Class I work, the employer responsible for erecting the enclosure must repair the breach immediately.)</p> <p>Verify that, in addition, all employers of employees exposed to asbestos hazards comply with applicable protective provisions to protect their employees.</p> <p>(NOTE: For example, if employees working immediately adjacent to a Class I asbestos job are exposed to asbestos due to the inadequate containment of such job, their employer must either remove the employees from the area until the enclosure breach is repaired; or perform an initial exposure assessment pursuant to 29 CFR 1926.1101(f) (see the checklist items in CA.40).)</p> <p>Verify that all employers of employees working adjacent to regulated areas established by another employer on a multi-employer worksite take steps on a daily basis to ascertain the integrity of the enclosure and/or the effectiveness of the control method relied on by the primary asbestos contractor to assure that asbestos fibers do not migrate to such adjacent areas.</p> <p>Verify that all general contractors on a construction project which includes work covered by this chapter are deemed to exercise general supervisory authority over the work covered by this chapter, even though the general contractor is not qualified to serve as the asbestos competent person as defined by 29 CFR 1926.1101(b) (see definitions).</p> <p>Verify that the general contractor, as supervisor of the entire project, ascertains whether the asbestos contractor is in compliance with this chapter, and requires such contractor to come into compliance with this chapter when necessary.</p>



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<p><b>CA.30</b>  <b>REGULATED AREAS</b></p> <p><b>CA.30.1.</b> Asbestos work must be conducted in regulated work areas in certain circumstances (29 CFR 1926.1101(e)(1)).</p> <p><b>CA.30.2.</b> Regulated areas must be demarcated from the rest of the work-place (29 CFR 1926.1101(e)(2)).</p> <p><b>CA.30.3.</b> Access to regulated areas must be limited (29 CFR 1926.1101 (e)(3)).</p> <p><b>CA.30.4.</b> Respirators that meet certain standards must be used in regulated areas (29 CFR 1926.1101(e)(4)).</p> <p><b>CA.30.5.</b> Certain activities are prohibited in restricted areas (29 CFR 1926.1101(e)(5)).</p> <p><b>CA.30.6.</b> All asbestos work performed within regulated areas must be supervised by a competent person (29 CFR 1926.1101(e)(6)).</p>	<p>Verify that all Class I, II, and III asbestos work is conducted within regulated areas.</p> <p>Verify that all other operations covered by this chapter are conducted within a regulated area where airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed an OEL.</p> <p>Verify that the regulated area is demarcated from the rest of the workplace in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos.</p> <p>(NOTE: Where critical barriers or negative pressure enclosures are used, they may demarcate the regulated area.)</p> <p>Verify that signs are provided and displayed pursuant to the requirements of 29 CFR 1926.1101(k)(7) (see checklist items CA.120.7 and CA.120.8).</p> <p>Verify that access to regulated areas is limited to authorized persons and to persons authorized by the Construction Safety Act or regulations issued pursuant thereto.</p> <p>Determine whether persons are entering a regulated area where personnel are required pursuant to 29 CFR 1926.1101(h)(1) (see checklist item CA.90.1) to wear respirators.</p> <p>Verify that all such persons are supplied with a respirator selected in accordance with the requirements of 29 CFR 1926.1101(h)(2) (see checklist items CA.90.2 through CA.90.5).</p> <p>Verify that personnel do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated area.</p> <p>Verify that all asbestos work performed within regulated areas is supervised by a competent person, as defined in 29 CFR 1926.1101(b) (see definitions).</p> <p>(NOTE: The duties of the competent person are set out in 29 CFR 1926.1101(o) (see the checklist items in CA.160).)</p>



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<b>CA.40 EXPOSURE ASSESSMENTS AND MONITORING</b>	
<b>CA.40.1.</b> Monitoring must satisfy certain general requirements (29 CFR 1926.1101(f)(1))	<p>Verify that each employer who has a workplace or work operation where exposure monitoring is required under this chapter performs monitoring to determine accurately the airborne concentrations of asbestos to which employees may be exposed.</p> <p>Verify that determinations of employee exposure are made from breathing zone air samples that are representative of the 8-h TWA and 30-min short-term exposures of each employee.</p> <p>Verify that representative 8-h TWA employee exposure is determined on the basis of one or more samples representing full-shift exposure for employees in each work area.</p> <p>Verify that representative 30-min short-term employee exposures are determined on the basis of one or more samples representing 30-min exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area.</p>
<b>CA.40.2.</b> Initial exposure assessments which meet certain requirements must be conducted under some circumstances (29 CFR 1926.1101(f)(2)(i) through (f)(2)(ii)).	<p>Determine whether the installation has a workplace or work operation covered by this chapter.</p> <p>Verify that a competent person conducts an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace.</p> <p>Verify that the assessment is completed in time to comply with requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation and will work properly.</p> <p>Verify that the initial exposure assessment is, if feasible, based on monitoring conducted pursuant to 29 CFR 1926.1101(f)(1)(iii) (see checklist item CA.40.1).</p> <p>(NOTE: This initial exposure assessment is not required if a negative exposure assessment has been made pursuant to the requirements of 29 CFR 1926.1101(f)(2)(iii) (see checklist item CA.40.3).)</p> <p>Verify that the assessment takes into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace.</p>

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<p><b>CA.40.3.</b> Negative exposure assessments, when performed, must comply with certain requirements (29 CFR 1926.1101(f)(2)(iii)).</p>	<p>or of the operations of the employer which indicate the levels of airborne asbestos likely to be encountered on the job.</p> <p>(NOTE: For Class I asbestos work, the employer must presume that employees are exposed in excess of the TWA and excursion limit until the employer either:</p> <ul style="list-style-type: none"> <li>- conducts exposure monitoring and documents that employees on that job will not be exposed in excess of the OELs, or</li> <li>- otherwise makes a negative exposure assessment pursuant to requirements below in the next checklist item.)</li> </ul> <p>(NOTE: For any one specific asbestos job which will be performed by employees who have been trained in compliance with this chapter, the employer may demonstrate that employee exposures will be below the OELs by performing a negative exposure assessment.)</p> <p>Determine whether a negative exposure assessment is to be performed.</p> <p>Verify that the employer demonstrates that employee exposures will be below the OELs by data which conforms to one of the following criteria:</p> <ul style="list-style-type: none"> <li>- objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release air-borne fibers in concentrations exceeding the TWA and excursion limit under those work conditions having the greatest potential for releasing asbestos; or</li> <li>- where the employer has monitored prior asbestos jobs for the OEL and the excursion limit within 12 mo of the current or projected job, the monitoring and analysis were performed in compliance with the asbestos standard in effect, and <ul style="list-style-type: none"> <li>- the data were obtained during work operations conducted under workplace conditions closely resembling (see definitions) the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations,</li> <li>- the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job, and these data show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that employee exposures will not exceed the TWA and excursion limit</li> </ul> </li> <li>- the results of initial exposure monitoring of the current job made from breathing zone air samples that are representative of the 8-h TWA and 30-min short-term exposures of each employee covering operations which are most likely during the performance of the entire asbestos job to result in exposures over the OELs.</li> </ul>

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<p><b>CA.40.4.</b> Periodic monitoring must satisfy certain requirements (29 CFR 1926.1101(f)(3)).</p>	<p>Verify that the employer conducts daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing Class I or II work.</p> <p>(NOTE: This requirement does not apply if the employer has made a negative exposure assessment for the entire operation pursuant to 29 CFR 1926.1101(f)(2)(iii) (see checklist item CA.40.3).)</p> <p>Verify that, for all operations under the chapter other than Class I and II operations, the employer conducts periodic monitoring of all work where exposures are expected to exceed an OEL, at intervals sufficient to document the validity of the exposure pre-diction.</p> <p>(NOTE: When all employees required to be monitored daily are equipped with supplied-air respirators operated in the pressure demand mode, or other positive pressure mode respirator, the employer may dispense with the daily monitoring required by this checklist item.)</p> <p>Verify that employees performing Class I work using a control method which is not listed in 29 CFR 1926.1101(g)(4)(i), (ii), or (iii) (see checklist item CA.50.4) or using a modification of a listed control method, continue to be monitored daily even if they are equipped with supplied-air respirators.</p> <p>(NOTE: If the periodic monitoring reveals that employee exposures, as indicated by statistically reliable measurements, are below the permissible exposure limit and excursion limit the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.)</p> <p>Verify that the employer institutes periodic exposure monitoring in either of the following instances:</p> <ul style="list-style-type: none"> <li>- there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the permissible exposure limit and/or excursion limit</li> <li>- when the employer has any reason to suspect that a change may result in new or additional exposures above the permissible exposure limit and/or excursion limit.</li> </ul> <p>(NOTE: Such additional monitoring is required regardless of whether a negative exposure assessment was previously produced for a specific job, and notwithstanding the provisions of 29 CFR 1926(f)(2) through (f)(4) (see checklist items CA.40.2 through CA.4).)</p>

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<p><b>CA.40.5.</b> Affected employees must be notified of the monitoring results (29 CFR 1926.1101(f)(5)).</p> <p><b>CA.40.6.</b> Personnel must be given an opportunity to observe any monitoring for asbestos exposure (29 CFR 1926(f)(6)).</p>	<p>Verify that affected employees are notified of the monitoring results that represent that employee's exposure as soon as possible following receipt of monitoring results.</p> <p>Verify that affected employees are notified of the results of monitoring representing the employee's exposure in writing either individually or by posting at a centrally located place that is accessible to affected employees.</p> <p>Verify that affected employees and their designated representatives are provided an opportunity to observe any monitoring of employee exposure to asbestos conducted in accordance with this chapter.</p> <p>Verify that, when observation of the monitoring of employee exposure to asbestos requires entry into an area where the use of protective clothing or equipment is required, the observer is provided with and required to use such clothing and equipment and complies with all other applicable safety and health procedures.</p>

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<p><b>METHODS OF COMPLIANCE</b></p> <p><b>CA.50</b> <b>Class I Asbestos Work</b></p> <p><b>CA.50.1.</b> Installations must use certain engineering controls and work practices for all operations covered by this chapter (29 CFR 1926.1101(g)(1)).</p> <p><b>CA.50.2.</b> Installations must use additional control methods to achieve compliance with the OEL (29 CFR 1926.1101(g)(2)).</p>	<p>(NOTE: The following engineering controls and work practices are used in all operations covered by this chapter, regardless of the levels of exposure.)</p> <p>Verify that vacuum cleaners equipped with HEPA filters are used to collect all debris and dust containing ACM and PACM.</p> <p>(NOTE: This requirement does not apply in the case of roofing material when other-wise provided for in 29 CFR 1926.1101(g)(8)(ii) (see checklist item CA.60.3).)</p> <p>Verify that wet methods, or wetting agents, are used to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup.</p> <p>(NOTE: This requirement does not apply when the installation demonstrates that the use of wet methods is infeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing (except as provided in 29 CFR 1926.1101(g)(8)(ii) (see checklist item CA.60.3)).)</p> <p>Verify that wastes and debris contaminated with asbestos are promptly cleaned-up and disposed of in leak-tight containers.</p> <p>(NOTE: This requirement does not apply in the case of roofing operations when otherwise provided for in 29 CFR 1926.1101(g)(8)(ii) (see checklist item CA.60.3).)</p> <p>Verify that the control methods presented in this checklist item are used to achieve compliance with:</p> <ul style="list-style-type: none"> <li>- the TWA permissible exposure limit of 0.1 f/cc of air (as an 8-h TWA)</li> <li>- the excursion limit of 1.0 f/cc of air averaged over 30 min.</li> </ul> <p>Verify that local exhaust ventilation equipped with a HEPA filter dust collection system is used.</p> <p>Verify that processes producing asbestos dust are enclosed or isolated.</p>

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<p><b>CA.50.3.</b> Certain work practices and engineering controls must not be used (29 CFR 1926.1101(g)(3)).</p> <p><b>CA.50.4.</b> Class I work must comply with certain additional requirements (29 CFR 1926.1101(g)(4)).</p>	<p>Verify that the regulated area is ventilated to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter.</p> <p>Verify that other work practices and engineering controls approved by the Assistant Secretary.</p> <p>Verify that, wherever the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the permissible exposure limit and/or excursion limit, the employer uses them to reduce employee exposure to the lowest levels attainable by these controls and supplements them by the use of respiratory protection.</p> <p>Verify that the following work practices and engineering controls are not used for work related to asbestos or for work which disturbs ACM or PACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:</p> <ul style="list-style-type: none"> <li>- high-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air</li> <li>- compressed air, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air</li> <li>- dry sweeping, shoveling or other dry clean-up of dust and debris containing ACM and PACM</li> <li>- employee rotation, as a means of reducing employee exposure to asbestos.</li> </ul> <p>(NOTE: These requirements are in addition to the provisions of 29 CFR 1926.1101(g)(1) and (2) (see checklist items CA.50.1 and CA.50.2).)</p> <p>Verify that all Class I work, including the installation and operation of the control system, is supervised by a competent person (see definitions).</p> <p>Determine whether any of the following work is being performed:</p> <ul style="list-style-type: none"> <li>- Class I jobs involving the removal of more than 25 linear ft or 10 ft<sup>2</sup> of thermal system insulation or surfacing material</li> <li>- other Class I jobs, where the employer cannot produce a negative exposure assessment where employees are working in areas adjacent to the regulated area, while the Class I work is being performed.</li> </ul> <p>Verify that, if such work is being performed, the employer uses one of the following methods to ensure that airborne asbestos does not migrate from the regulated area:</p>

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<p><b>CA.50.5.</b> Class I asbestos work must be performed using specific control methods (29 CFR 1926.1101(g)(5)).</p>	<ul style="list-style-type: none"> <li>- critical barriers over all the openings to the regulated area, except where activities are performed outdoors</li> <li>- another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust and either:               <ul style="list-style-type: none"> <li>- perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule are met or</li> <li>- that perimeter area levels, measured by Phase Contrast Microscopy (PCM) are no more than background levels representing the same area before the asbestos work began.</li> </ul> </li> </ul> <p>Verify that the results of such monitoring are made known to the employer no later than 24 h from the end of the work shift represented by such monitoring.</p> <p>(NOTE: This requirement regarding airborne asbestos migration does not apply for work completed outdoors where employees are not working in areas adjacent to the regulated areas, when the specific control methods in 29 CFR 1926.1101(g)(5) (see checklist items CA.50.5 through CA.50.11) are used.)</p> <p>Verify that, for all Class I jobs, HVAC systems are isolated in the regulated area by sealing with a double layer of 6 mil plastic or the equivalent.</p> <p>Verify that, for all Class I jobs, impermeable dropcloths are placed on surfaces beneath all removal activity.</p> <p>Verify that, for all Class I jobs, all objects within the regulated area are covered with impermeable dropcloths or plastic sheeting which is secured by duct tape or an equivalent.</p> <p>Verify that, for all Class I jobs where the employer cannot produce a negative exposure assessment, or where exposure monitoring shows that an OEL is exceeded, the employer ventilates the regulated area to move contaminated air away from the breathing zone of employees toward a HEPA filtration or collection device.</p> <p>Verify that Class I asbestos work is performed using one or more of the following control methods pursuant to the appropriate limitations:</p> <ul style="list-style-type: none"> <li>- negative pressure enclosure (NPE) systems</li> <li>- glove bag systems</li> <li>- negative pressure glove bag systems</li> <li>- negative pressure glove box systems</li> <li>- water spray process systems</li> <li>- mini-enclosure</li> </ul>

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<p><b>CA.50.6.</b> NPEs must comply with certain requirements (29 CFR 1926.1101(g)(5)(i)).</p>	<p>Verify that the configuration of the work area does not make the erection of the NPE infeasible.</p> <p>Verify that the NPE system complies with the following specifications:</p> <ul style="list-style-type: none"> <li>- at least 4 air changes per hour are maintained in the NPE</li> <li>- a minimum of -0.02 column in. of water pressure differential, relative to outside pressure, is maintained within the NPE as evidenced by manometric measurements</li> <li>- the NPE is kept under negative pressure throughout the period of its use</li> <li>- air movement is directed away from employees performing asbestos work within the enclosure, and toward a HEPA filtration or a collection device.</li> </ul> <p>(NOTE: The NPE may be of any configuration.)</p> <p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- before beginning work within the enclosure and at the beginning of each shift, the NPE is inspected for breaches and smoke-tested for leaks, and any leaks sealed</li> <li>- electrical circuits in the enclosure are deactivated, unless equipped with ground-fault circuit interrupters.</li> </ul>
<p><b>CA.50.7.</b> Glove bag systems must comply with certain requirements (29 CFR 1926.1101(g)(5)(ii)).</p>	<p>(NOTE: Glove bag systems may be used to remove PACM and/or ACM from straight runs of piping and elbows and other connections.)</p> <p>Verify that the glovebag system complies with the following specifications:</p> <ul style="list-style-type: none"> <li>- glovebags are made of 6-mil thick plastic and must be seamless at the bottom</li> <li>- glovebags used on elbows and other connections are designed for that purpose and used without modifications.</li> </ul> <p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- each glovebag is installed so that it completely covers the circumference of pipe or other structure where the work is to be done</li> <li>- glovebags are smoke-tested for leaks and any leaks sealed prior to use</li> <li>- glovebags are used only once and are not moved</li> <li>- no glovebags are used on surfaces whose temperature exceeds 150 °F</li> <li>- before beginning the operation, loose and friable material adjacent to the glove-bag/box operation is wrapped and sealed in two layers of six mil plastic or otherwise rendered intact</li> <li>- where the system uses an attached waste bag, such bag is connected to collection bag using hose or other material which must withstand pressure of ACM waste and water without losing its integrity</li> </ul>

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<p><b>CA.50.8.</b> Negative pressure glove bag systems must comply with certain requirements (29 CFR 1926.1101(g)(5)(iii)).</p>	<ul style="list-style-type: none"> <li>- a sliding valve or other device separates the waste bag from the hose to ensure no exposure when the waste bag is disconnected</li> <li>- at least two persons perform Class I glovebag removal operations</li> <li>- prior to disposal, glovebags are collapsed by removing air within them using a HEPA vacuum.</li> </ul> <p>(NOTE: Negative pressure glove bag systems may be used to remove ACM or PACM from piping.)</p> <p>Verify that, in addition to specifications for glove bag systems in checklist item CA.50.7, negative pressure glove bag systems have HEPA vacuum systems or other devices attached to the bags to prevent collapse during removal.</p> <p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- the employer complies with the work practices for glove bag systems in 29 CFR 1926.1101(g)(5)(ii)(B)(4) (see checklist item CA.50.7)</li> <li>- the HEPA vacuum cleaner or other device used to prevent collapse of the bag during removal runs continually during the operation until it is completed at which time the bag is collapsed prior to removal of the bag from the pipe.</li> </ul> <p>(NOTE: Where a separate waste bag is used along with a collection bag and discarded after one use, the collection bag may be reused if rinsed clean with amended water before reuse.)</p>
<p><b>CA.50.9.</b> Negative pressure glove box systems must comply with certain requirements (29 CFR 1926.1101(g)(5)(iv)).</p>	<p>(NOTE: Negative pressure glove boxes may be used to remove ACM or PACM from pipe runs.)</p> <p>Verify that the negative pressure glove box system complies with the following specifications:</p> <ul style="list-style-type: none"> <li>- glove boxes are constructed with rigid sides and made from metal or other material which can withstand the weight of the ACM and PACM and water used during removal</li> <li>- a negative pressure generator is used to create negative pressure in the system</li> <li>- an air filtration unit is attached to the box</li> <li>- the box is fitted with gloved apertures</li> <li>- an aperture at the base of the box serves as a bagging outlet for waste ACM and water</li> <li>- a back-up generator is present on site</li> <li>- waste bags consist of 6-mil thick plastic double-bagged before they are filled or of plastic thicker than 6 mil.</li> </ul>

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<p><b>CA.50.10.</b> Water spray process systems must comply with certain requirements (29 CFR 1926.1101(g)(5)(v)).</p>	<p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- at least two persons perform the removal</li> <li>- the box is smoke-tested for leaks and any leaks sealed prior to each use</li> <li>- loose or damaged ACM adjacent to the box is wrapped and sealed in two layers of 6 mil plastic prior to the job, or otherwise made intact prior to the job</li> <li>- a HEPA filtration system is used to maintain pressure barrier in box.</li> </ul> <p>(NOTE: A water spray process system may be used for removal of ACM and PACM from cold line piping.)</p> <p>Verify that employees carrying out a water spray process have completed a 40-h separate training course in its use, in addition to training required for employees performing Class I work.</p> <p>Verify that the water spray process system complies with the following specifications:</p> <ul style="list-style-type: none"> <li>- piping is surrounded on three sides by rigid framing</li> <li>- a 360-degree water spray, delivered through nozzles supplied by a high pressure separate water line, is formed around the piping</li> <li>- the spray collides to form a fine aerosol which provides a liquid barrier between workers and the ACM and PACM.</li> </ul> <p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- the system is run for at least 10 min before removal begins</li> <li>- all removal takes place within the water barrier</li> <li>- the system is operated by at least three persons, one of whom must not perform removal, but checks equipment, and ensures proper operation of the system</li> <li>- after removal, the ACM and PACM is bagged while still inside the water barrier.</li> </ul>
<p><b>CA.50.11.</b> Mini-enclosures must comply with certain requirements (29 CFR 1926.1101(g)(5)(vi)).</p>	<p>Verify that the disturbance or removal can be completely contained by the enclosure.</p> <p>Verify that the mini-enclosure complies with the following specifications:</p> <ul style="list-style-type: none"> <li>- the fabricated or job-made enclosure is constructed of 6 mil plastic or equivalent</li> <li>- the enclosure is placed under negative pressure by means of a HEPA filtered vacuum or similar ventilation unit.</li> </ul>

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<p><b>CA.50.12.</b> Alternative control measures for Class I work must satisfy certain requirements (29 CFR 1926.1101(g)(6)).</p>	<p>Verify that the following work practices are followed:</p> <ul style="list-style-type: none"> <li>- before use, the mini-enclosure is inspected for leaks and smoke-tested to detect breaches, and any breaches are sealed</li> <li>- before reuse, the interior is completely washed with amended water and HEPA- vacuumed</li> <li>- during use, air movement is directed away from the employee's breathing zone within the mini-enclosure.</li> </ul> <p>(NOTE: Class I work may be performed using a control method which is not referenced in or which modifies a control method referenced in 29 CFR 1926.1101(g)(5) (see checklist items CA.50.5 through CA.50.11), if the requirements in this checklist item are complied with.)</p> <p>Verify that the control method encloses, contains or isolates the processes or source of airborne asbestos dust, or otherwise captures or redirects such dust before it enters the breathing zone of employees.</p> <p>Verify that a certified industrial hygienist or licensed professional engineer who is also qualified as a project designer:</p> <ul style="list-style-type: none"> <li>- evaluates the work area, the projected work practices, and the engineering controls</li> <li>- certifies in writing that the planned control method is adequate to reduce direct and indirect employee exposure to below the OELs under worst-case conditions of use, and that the planned control method will prevent asbestos contamination outside the regulated area, as measured by clearance sampling which meets the requirements of EPA's Asbestos in Schools rule issued under AHERA, or perimeter monitoring which meets the criteria in 29 CFR 1926.1101(g)(4)(ii)(B) (see checklist item CA.50.4).</li> </ul> <p>(NOTE: Where the TSI or surfacing material to be removed is 25 linear ft or 10 ft<sup>2</sup> or less, the evaluation required in this checklist item may be performed by a competent person, and the consideration of perimeter or clearance monitoring otherwise required may be omitted.)</p> <p>Verify that the evaluation of employee exposure required in this checklist item includes and is based on sampling and analytical data representing employee exposure during the use of such method under worst-case conditions and by employees whose training and experience are equivalent to employees who are to perform the current job.</p>

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	<p>Verify that, before work which involves the removal of more than 25 linear ft or 10 ft<sup>2</sup> of thermal system insulation or surfacing material is begun using an alternative method which has been the subject of a required evaluation and certification, the employer sends a copy of such evaluation and certification to the national office of OSHA, Office of Technical Support, Room N3653, 200 Constitution Avenue, NW, Washington, DC 20210.</p> <p>(NOTE: This submission does not constitute approval of the alternative method by OSHA.)</p>

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<p><b>METHODS OF COMPLIANCE</b></p> <p><b>CA.60</b>  <b>Class II Asbestos Work</b></p> <p><b>CA.60.1.</b> Class II work must comply with certain work practice and engineering controls (29 CFR 1926.1101(g)(7)).</p>	<p>(NOTE: Where more than one control method may be used for a type of asbestos work, the employer may choose one or a combination of designated control methods. Class II work also may be performed using a method allowed for Class I work, except that glove bags and glove boxes are allowed if they fully enclose the Class II material to be removed.)</p> <p>Verify that all Class II work is supervised by a competent person.</p> <p>Determine whether any of the following work is being performed:</p> <ul style="list-style-type: none"> <li>- indoor Class II jobs where the employer has not produced a negative exposure assessment pursuant to 29 CFR 1926.1101(f)(2)(iii) (see checklist item CA.40.3)</li> <li>- indoor Class II jobs where during the job, changed conditions indicate there may be exposure above the OEL or where the employer does not remove the ACM in a substantially intact state.</li> </ul> <p>Verify that, for such jobs, the employer uses one of the following methods to ensure that airborne asbestos does not migrate from the regulated area:</p> <ul style="list-style-type: none"> <li>- critical barriers over all openings to the regulated area, or</li> <li>- another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area monitoring or clearance monitoring which meets the following criteria: <ul style="list-style-type: none"> <li>- perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust, and either: <ul style="list-style-type: none"> <li>- perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule are met or</li> <li>- that perimeter area levels, measured by PCM, are no more than back-ground levels representing the same area before the asbestos work began.</li> </ul> </li> </ul> </li> </ul> <p>Verify that impermeable dropcloths are placed on surfaces beneath all removal activity.</p> <p>Verify that all Class II asbestos work is performed using the work practices and requirements set out in 29 CFR 1926.1101(g)(1)(i) through (g)(1)(iii) (see checklist item CA.50.1).</p>

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<p><b>CA.60.2.</b> Certain work practices must be complied with when removing flooring (29 CFR 1926.1101(g)(8)(i)).</p>	<p>Determine whether the removal of the following vinyl and asphalt flooring materials is being performed:</p> <ul style="list-style-type: none"> <li>- flooring materials which contain ACM</li> <li>- flooring materials in buildings constructed no later than 1980, in which an industrial hygienist has not verified the absence of ACM.</li> </ul> <p>Verify that the employer ensures that employees comply with the following work practices:</p> <ul style="list-style-type: none"> <li>- flooring or its backing is not sanded</li> <li>- vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) are used to clean floors</li> <li>- resilient sheeting is removed by cutting with wetting of the snip point and wetting during delamination</li> <li>- resilient sheet floor material is not ripped up</li> <li>- all scraping of residual adhesive and/or backing is performed using wet methods</li> <li>- no dry sweeping occurs</li> <li>- no mechanical chipping occurs unless performed in a negative pressure enclosure which meets the requirements of 29 CFR 1926.1101(g)(5)(i) (see checklist item CA.50.6)</li> <li>- tiles are removed intact, unless the employer demonstrates that intact removal is not possible.</li> </ul> <p>(NOTE: When tiles are heated and can be removed intact, wetting may be omitted.)</p> <p>(NOTE: Resilient flooring material including associated mastic and backing is assumed to be asbestos-containing unless an industrial hygienist determines that it is asbestos-free using recognized analytical techniques.)</p> <p>Verify that employees are trained in these work practices pursuant to 29 CFR 1926.1101(k)(9) (see checklist items CA.120.12 through CA.120.17).</p>
<p><b>CA.60.3.</b> Certain work practices must be complied with when removing ACM containing roofing materials (1926.1101(g)(8)(ii)).</p>	<p>Verify that the employer ensures that the following work practices for removing roofing material which contains ACM are followed:</p> <ul style="list-style-type: none"> <li>- roofing material is removed in an intact state to the extent feasible</li> <li>- wet methods are used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards</li> <li>- cutting machines are continuously misted during use, unless a competent person determines that misting substantially decreases worker safety</li> <li>- when removing built-up roofs with asbestos-containing roofing felts and an aggregate surface using a power roof cutter, all dust resulting from the cutting operation is collected by a HEPA dust collector, or is HEPA vacuumed</li> </ul>

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<p><b>CA.60.4.</b> Certain work practices must be complied with when removing cementitious asbestos- containing siding and shingles or transite panels containing ACM on building exteriors (29 CFR 1926.1101(g)(8)(iii)).</p>	<ul style="list-style-type: none"> <li>by vacuuming along the cut line</li> <li>- when removing built-up roofs with asbestos-containing roofing felts and a smooth surface using a power roof cutter, the dust resulting from the cutting operation is collected either by a HEPA dust collector or HEPA vacuuming along the cut line, or by gently sweeping and then carefully and completely wiping up the still-wet dust and debris left along the cut line</li> <li>- ACM that has been removed from a roof is not dropped or thrown to the ground</li> <li>- unless the ACM is carried or passed to the ground by hand, it is lowered to the ground via covered, dust-tight chute, crane, or hoist</li> <li>- any ACM that is not intact is lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift</li> <li>- while ACM that is not intact remains on the roof, it is either kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting</li> <li>- intact ACM is lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift.</li> <li>- upon being lowered, unwrapped material is transferred to a closed receptacle in such manner as to preclude the dispersion of dust</li> <li>- roof level heating and ventilation air intake sources are isolated or the ventilation system is shut down</li> </ul> <p>(NOTE: The removal or repair of sections of intact roofing less than 25 ft<sup>2</sup> in area does not require the use of wet methods or HEPA vacuuming as long as manual methods which do not render the material non-intact are used to remove the material and no visible dust is created by the removal method used. In determining whether a job involves less than 25 ft<sup>2</sup>, the employer must include all removal and repair work performed on the same roof on the same day.)</p> <p>Verify that the employer ensures that the following work practices are followed when removing cementitious asbestos-containing siding and shingles or transite panels containing ACM on building exteriors (other than roofs):</p> <ul style="list-style-type: none"> <li>- no cutting, abrading or breaking siding, shingles, or transite panels occurs, unless the employer can demonstrate that methods less likely to result in asbestos fiber release cannot be used</li> <li>- each panel or shingle is sprayed with amended water prior to removal</li> <li>- unwrapped or unbagged panels or shingles are immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift</li> <li>- nails are cut with flat, sharp instruments.</li> </ul>

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<p><b>CA.60.5.</b> Certain work practices must be complied with when removing gaskets containing ACM (29 CFR 1926.1101(g)(8)(iv)).</p>	<p>Verify that the employer ensures that the following work practices are adhered to when removing gaskets containing ACM:</p> <ul style="list-style-type: none"> <li>- the gasket is removed within a glovebag if the gasket is visibly deteriorated and is unlikely to be removed intact</li> <li>- the gasket is immediately placed in a disposal container</li> <li>- any scraping to remove residue is performed wet.</li> </ul>
<p><b>CA.60.6.</b> Certain work practices must be complied with when performing any Class II removal of ACM which is not covered by specific controls listed for gaskets (29 CFR 1926.1101(g)(8)(v)).</p>	<p>Verify that the employer ensures that the following work practices are complied with when Class II removal of ACM which is not covered by specific controls listed for gaskets is carried out:</p> <ul style="list-style-type: none"> <li>- the material is thoroughly wetted with amended water prior to and during its removal</li> <li>- the material is removed in an intact state unless the employer demonstrates that intact removal is not possible</li> <li>- no cutting, abrading or breaking the material occurs, unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible</li> <li>- the removed ACM is immediately bagged or wrapped, or kept wetted until transferred to a closed receptacle, no later than the end of the work shift.</li> </ul>
<p><b>CA.60.7.</b> Certain requirements must be satisfied if the employer uses alternative work practices and controls (29 CFR 1926.1101(g)(8)(vi)).</p>	<p>(NOTE: Instead of the work practices and controls listed in 29 CFR 1926.1101(g)(8)(i) through (v) (see checklist items CA.60.2 through CA.60.6), the employer may use different or modified engineering and work practice controls if the provisions in this checklist item are complied with.)</p> <p>Verify that the employer demonstrates by data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used, that employee exposure will not exceed the OELs under any anticipated circumstances.</p> <p>Verify that a competent person evaluates the work area, the projected work practices and the engineering controls, and certifies in writing, that the different or modified controls are adequate to reduce direct and indirect employee exposure to below the OELs under all expected conditions of use and that the method meets the requirements of this chapter.</p> <p>Verify that the evaluation includes and is based on data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used for the current job, and by employees whose training and experience are equivalent to employees who are to perform the current job.</p>

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<p><b>METHODS OF COMPLIANCE</b></p> <p><b>CA.70</b>  <b>Class III Asbestos Work</b></p> <p><b>CA.70.1.</b> Class III asbestos work must be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees (29 CFR 1926.1101(g)(9)).</p>	<p>Verify that Class III asbestos work is conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees.</p> <p>Verify that the work is performed using wet methods.</p> <p>Verify that, to the extent feasible, the work is performed using local exhaust ventilation.</p> <p>Verify that, where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of thermal system insulation or surfacing material, the employer uses impermeable dropcloths, and isolates the operation using mini-enclosures or glove bag systems or another isolation method.</p> <p>Verify that, where the employer does not produce a negative exposure assessment for a job, or where monitoring results show the OEL has been exceeded, the employer contains the area using impermeable dropcloths and plastic barriers or their equivalent, or isolates the operation using a control system listed in and in compliance with 29 CFR 1926.1101(g)(5) (see checklist items CA.50.5 through CA.50.11).</p> <p>Verify that employees wear respirators which are selected, used, and fitted pursuant to provisions of 29 CFR 1926.1101(h) (see the checklist items in CA.90) while performing Class III jobs in any of the following instances:</p> <ul style="list-style-type: none"> <li>- when thermal system insulation or surfacing material is disturbed</li> <li>- when the employer does not produce a negative exposure assessment, or</li> <li>- when monitoring results show an OEL has been exceeded.</li> </ul>



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<p><b>METHODS OF COMPLIANCE</b></p> <p><b>CA.80</b> <b>Class IV Asbestos Work</b></p> <p><b>CA.80.1.</b> Class IV asbestos work must be performed in accordance with certain requirements (29 CFR 1926.1101(g)(10)).</p> <p><b>CA.80.2.</b> Specific requirements must be satisfied when alternative methods of compliance for installation, removal, repair, and maintenance of certain roofing and pipeline coating materials are used (29 CFR 1926.1101(g)(11)).</p>	<p>Verify that Class IV asbestos jobs are conducted by employees trained pursuant to the asbestos awareness training program set out in 29 CFR 1926.1101(k)(9) (see checklist items CA.120.12 through CA.120.17).</p> <p>Verify that all Class IV jobs are conducted in conformity with the requirements set out in 29 CFR 1926.1101(g)(1) (see checklist item CA.50.1).</p> <p>Determine whether employees are cleaning up debris and waste in a regulated area where respirators are required.</p> <p>Verify that such employees wear respirators which are selected, used and fitted pursuant to provisions of 29 CFR 1926.1101(h) (see the checklist items in CA.90).</p> <p>(NOTE: It must be assumed that waste and debris, in areas where friable thermal system insulation or surfacing material is accessible, contains asbestos.)</p> <p>(NOTE: An employer who complies with all provisions of this checklist item when installing, removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof cements, mastics, coatings, or flashings which contain asbestos fibers encapsulated or coated by bituminous or resinous compounds is deemed to be in compliance with this chapter.)</p> <p>(NOTE: If an employer does not comply with all provisions of this checklist item, or if during the course of the job the material does not remain intact, the provisions of 29 CFR 1926.1101(g)(8) (see checklist items CA.60.2 through CA.60.7) apply instead of the requirements of this checklist item.)</p> <p>Verify that, before work begins and as needed during the job, a competent person who is capable of identifying asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate such hazards, conducts an inspection of the worksite and determines that the roofing material is intact and will likely remain intact.</p>

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	<p>Verify that all employees performing work covered by this checklist item are trained in a training program that meets the requirements of 29 CFR 1926.1101(k)(9)(viii) (see checklist item CA.120.17).</p> <p>Verify that the material is not sanded, abraded, or ground.</p> <p>Verify that manual methods which do not render the material non-intact are used.</p> <p>Verify that material that has been removed from a roof is not dropped or thrown to the ground.</p> <p>Verify that, unless the material is carried or passed to the ground by hand, it is lowered to the ground via covered, dust-tight chute, crane, or hoist.</p> <p>Verify that all such material is removed from the roof as soon as is practicable, but in any event no later than the end of the work shift.</p> <p>Verify that, where roofing products which have been labeled as containing asbestos pursuant to 29 CFR 1926.1101(k)(8) (see checklist items CA.120.9 through CA.120.11) are installed on non-residential roofs during operations covered by this checklist item, the employer notifies the building owner of the presence and location of such materials no later than the end of the job.</p> <p>Verify that all removal or disturbance of pipeline asphaltic wrap is performed using wet methods.</p>

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<p><b>CA.90 RESPIRATORY PROTECTION</b></p> <p><b>CA.90.1.</b> Respirators must be used in certain circumstances (29 CFR 1926.1101(h)(1)).</p> <p><b>CA.90.2.</b> Appropriate respirators must be selected, provided, and used (29 CFR 1926.1101(h)(2)(i) and (h)(2)(ii)).</p> <p><b>CA.90.3.</b> The employer must provide a tight fitting powered, air purifying respirator (PAPR) in certain circumstances (29 CFR 1926.1101(h)(2)(iii)).</p>	<p>Verify that respirators are used in the following circumstances:</p> <ul style="list-style-type: none"> <li>- during all Class I asbestos jobs</li> <li>- during all Class II work where the ACM is not removed in a substantially intact state</li> <li>- during all Class II and III work which is not performed using wet methods</li> <li>- during all Class II and III asbestos jobs where the employer does not produce a negative exposure assessment</li> <li>- during all Class III jobs where TSI or surfacing ACM or PACM is being disturbed</li> <li>- during all Class IV work performed within regulated areas where employees performing other work are required to wear respirators</li> <li>- during all work where employees are exposed above the TWA or excursion limit</li> <li>- in emergencies.</li> </ul> <p>(NOTE: Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and the ACM is removed in an intact state.)</p> <p>Verify that, where respirators are used, the employer selects and provides, at no cost to the employee, the appropriate respirator as specified in Appendix 36-1 or 29 CFR 1926.1101(h)(2)(iii) (see checklist item CA.90.3).</p> <p>Verify that the employer ensures that the employee uses the respirator provided.</p> <p>Verify that the employer selects respirators from among those jointly approved as being acceptable for protection by MSHA and NIOSH.</p> <p>Verify that the employer provides a tight fitting PAPR in lieu of any negative-pressure respirator specified in Appendix 36-1 whenever:</p> <ul style="list-style-type: none"> <li>- an employee chooses to use this type of respirator; and</li> <li>- this respirator will provide adequate protection to the employee.</li> </ul> <p>Verify that the employer informs any employee required to wear a respirator under 29 CFR 1926.1101(h)(2) (see checklist items CA.90.2 through CA.90.5) that the employee may require the employer to provide a powered, air-purifying respirator in lieu of a negative pressure respirator.</p>

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<p><b>CA.90.4.</b> The employer must provide a half-mask air purifying respirator in certain circumstances (29 CFR 1926.1101(h)(2)(iv)).</p> <p><b>CA.90.5.</b> The employer must provide specific respirators in certain distances (29 CFR 1926.1101(h)(2)(v)).</p>	<p>(NOTE: This requirement applies in addition to the respirator selection criteria above.)</p> <p>Verify that the employer provides a half-mask air purifying respirator, other than a disposable respirator, equipped with high efficiency filters whenever the employee performs the following activities:</p> <ul style="list-style-type: none"> <li>- Class II and III asbestos jobs where the employer does not produce a negative exposure assessment</li> <li>- Class III jobs where TSI or surfacing ACM or PACM is being disturbed.</li> </ul> <p>(NOTE: These requirements apply in addition to the respirator selection criteria above.)</p> <p>Determine whether employees are within the regulated area where Class I work is being performed for which a negative exposure assessment has not been produced and where the exposure assessment indicates the exposure level will not exceed 1 f/cc as an 8-h TWA.</p> <p>Verify that, for such employees, the employer provides one of the following respirators:</p> <ul style="list-style-type: none"> <li>- a tight-fitting powered air purifying respirator equipped with high efficiency filters</li> <li>- a full facepiece supplied air respirator operated in the pressure demand mode equipped with HEPA egress cartridges</li> <li>- an auxiliary positive pressure self-contained breathing apparatus.</li> </ul> <p>Verify that a full facepiece supplied air respirator operated in the pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus is provided under the above conditions, if the exposure assessment indicates exposure levels above 1 f/cc as an 8-h TWA.</p>
<p><b>CA.90.6.</b> Respiratory protection programs must satisfy certain requirements (29 CFR 1926.1101(h)(3)).</p>	<p>Verify that, where respiratory protection is used, the employer institutes a respiratory protection program in accordance with 29 CFR 1910.134(b), (d), (e), and (f) (PE.30.4, PE.30.5, PE.30.7, PE.30.9, PE.40.2, PE.60.1 through PE.60.3, PE.60.7, PE.70.1, PE.70.2, PE.70.4 through PE.70.7, PE.80.1, PE.90.2, PE.100.2, PE.100.3, PE.100.5).</p> <p>Verify that the employer:</p> <ul style="list-style-type: none"> <li>- permits each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected</li> <li>- maintains an adequate supply of filter elements for this purpose.</li> </ul>

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<p><b>CA.90.7.</b> Fit testing must be performed in accordance with certain requirements (29 CFR 1926.1101(h)(4)).</p>	<p>Verify that employees who wear respirators are permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.</p> <p>Verify that an employee is not assigned to tasks requiring the use of respirators if, based on his or her most recent examination, an examining physician determines that either:</p> <ul style="list-style-type: none"> <li>- the employee will be unable to function normally wearing a respirator</li> <li>- the safety or health of the employee or of other employees will be impaired by the use of a respirator.</li> </ul> <p>Verify that such employees are assigned to another job or given the opportunity to transfer to a different position, the duties of which he or she is able to perform with the same employer, in the same geographical area, and with the same seniority, status, and rate of pay and other job benefits he or she had just prior to such transfer, if such a different position is available.</p> <p>Verify that the employer ensures that the respirator issued to the employee exhibits the least possible facepiece leakage and that the respirator is fitted properly.</p> <p>Verify that employers perform either quantitative or qualitative face fit tests at the time of initial fitting and at least every 6 mo thereafter for each employee wearing a negative-pressure respirator.</p> <p>Verify that the qualitative fit tests are used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted.</p> <p>Verify that qualitative and quantitative fit tests are conducted in accordance with Appendix C to 29 CFR 1926.1101.</p> <p>Verify that the tests are used to select facepieces that provide the required protection as prescribed in Appendix 36-1.</p>



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<p><b>CA.100 PROTECTIVE CLOTHING</b></p> <p><b>CA.100.1.</b> The employer must provide and require the use of protective clothing (29 CFR 1926.1101(i)(1)).</p> <p><b>CA.100.2.</b> Laundering of contaminated clothing must be performed in accordance with certain requirements (29 CFR 1926.1101(i)(2)).</p> <p><b>CA.100.3.</b> Contaminated clothing must be containerized and labeled in accordance with certain requirements (29 CFR 1926.1101(i)(3)).</p> <p><b>CA.100.4.</b> Worksuits must be inspected and immediately mended (29 CFR 1926.1101(i)(4)).</p>	<p>Verify that the employer provides and requires the use of protective clothing, such as coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings for any employee that is either:</p> <ul style="list-style-type: none"> <li>- exposed to airborne concentrations of asbestos: <ul style="list-style-type: none"> <li>- that exceed either the TWA permissible exposure limit of 0.1 f/cc of air (as an 8-h TWA) or the excursion limit of 1.0 f/cc of air averaged over 30 min</li> <li>- for which a required negative exposure assessment is not produced</li> </ul> </li> <li>- performing Class I operations which involve the removal of over 25 linear ft or 10 ft<sup>2</sup> of TSI or surfacing ACM and PACM.</li> </ul> <p>Verify that the employer ensures that laundering of contaminated clothing is done so as to prevent the release of airborne asbestos in excess of the OEL.</p> <p>Verify that any employer who gives contaminated clothing to another person for laundering informs such person of the requirement to effectively prevent the release of airborne asbestos in excess of the OEL.</p> <p>Verify that contaminated clothing is:</p> <ul style="list-style-type: none"> <li>- transported in sealed impermeable bags, or other closed, impermeable containers</li> <li>- labeled in accordance with 29 CFR 1926.1101(k) (see the checklist items in CA.120).</li> </ul> <p>Verify that the competent person examines worksuits worn by employees at least once per workshift for rips or tears that may occur during performance of work.</p> <p>Verify that, when rips or tears are detected while an employee is working, the rips and tears are immediately mended, or the worksuit is immediately replaced.</p>



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<p><b>CA.110</b>  <b>HYGIENE FACILITIES AND PRACTICES</b></p> <p><b>CA.110.1.</b> Class I asbestos jobs involving over 25 linear ft or 10 ft<sup>2</sup> of TSI or surfacing ACM and PACM must be performed in accordance with certain requirements (29 CFR 1926.1101(j)(1)).</p>	<p>Verify that the employer establishes a decontamination area that is adjacent and connected to the regulated area for the decontamination of such employees.</p> <p>Verify that the decontamination area consists of an equipment room, shower area, and clean room in series.</p> <p>Verify that the employer ensures that employees enter and exit the regulated area through the decontamination area.</p> <p>Verify that the equipment room is supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment.</p> <p>Verify that shower facilities are provided which comply with 29 CFR 1910.141(d)(3) (see checklist items SN.70.4 through SN.70.7), unless the employer can demonstrate that they are not feasible.</p> <p>Verify that the showers are adjacent both to the equipment room and the clean room, unless the employer can demonstrate that this location is not feasible.</p> <p>Verify that, where the employer can demonstrate that it is not feasible to locate the shower between the equipment room and the clean room, or where the work is performed outdoors, the employer ensures that employees either:</p> <ul style="list-style-type: none"> <li>- remove asbestos contamination from their worksuits in the equipment room using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area</li> <li>- remove their contaminated worksuits in the equipment room, then don clean worksuits, and proceed to a shower that is not adjacent to the work area.</li> </ul> <p>Verify that the clean change room is equipped with a locker or appropriate storage container for each employee's use.</p> <p>(NOTE: When the employer can demonstrate that it is not feasible to provide a clean change area adjacent to the work area or where the work is performed outdoors, the employer may permit employees engaged in Class I asbestos jobs to clean their protective clothing with a portable HEPA-equipped vacuum before such employees leave the regulated area.)</p>

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<p><b>CA.110.2.</b> Equipment rooms or areas must be provided for employees performing Class I asbestos jobs involving less than 25 linear ft or 10 ft<sup>2</sup> of TSI or surfacing ACM and PACM, and Class II and Class III asbestos work operations where exposures exceed an OEL or where there is no negative exposure assessment produced before the operation (29 CFR 1926.1101(j)(2)).</p>	<p>Verify that, following showering, employees who use the HEPA vacuum method then change into street clothing in clean change areas provided by the employer which otherwise meet the requirements of this checklist item.</p> <p>Verify that the employer ensures that employees:</p> <ul style="list-style-type: none"> <li>- enter the decontamination area through the clean room</li> <li>- remove and deposit street clothing within a locker provided for their use</li> <li>- put on protective clothing and respiratory protection before leaving the clean room.</li> </ul> <p>Verify that the employer ensures that, before entering the regulated area, employees pass through the equipment room.</p> <p>Verify that the employer ensures that:</p> <ul style="list-style-type: none"> <li>- before leaving the regulated area, employees remove all gross contamination and debris from their protective clothing</li> <li>- employees remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers</li> <li>- employees do not remove their respirators in the equipment room</li> <li>- employees shower prior to entering the clean room</li> <li>- after showering, employees enter the clean room before changing into street clothes.</li> </ul> <p>Verify that, whenever food or beverages are consumed at the worksite where employees are performing Class I asbestos work, the employer provides lunch areas in which the airborne concentrations of asbestos are below the permissible exposure limit and/or excursion limit.</p> <p>Verify that the employer establishes an equipment room or area that is adjacent to the regulated area for the decontamination of employees and their equipment which is contaminated with asbestos.</p> <p>Verify that such equipment room or area consists of an area covered by a impermeable drop cloth on the floor or horizontal working surface.</p> <p>Verify that the area is of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area (as determined by visible accumulations).</p> <p>Verify that work clothing is cleaned with a HEPA vacuum before it is removed.</p> <p>Verify that all equipment and surfaces of containers filled with ACM are cleaned prior to removing them from the equipment room or area.</p>

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<p><b>CA.110.3.</b> Class IV asbestos work must be performed in accordance with certain requirements (29 CFR 1926.1101(j)(3)).</p> <p><b>CA.110.4.</b> The employer must ensure that employees do not smoke in work areas where they are occupationally exposed to asbestos (29 CFR 1926.1101(j)(4)).</p>	<p>Verify that the employer ensures that employees enter and exit the regulated area through the equipment room or area.</p> <p>Verify that employers ensure that employees performing Class IV work within a regulated area comply with the hygiene practice required of employees performing work which has a higher classification within that regulated area.</p> <p>Verify that employers of employees cleaning up debris and material which is TSI or surfacing ACM or identified as PACM provide decontamination facilities for such employees which are required by 29 CFR 1926.1101(j)(2) (see checklist item CA.110.2).</p> <p>Verify that the employer ensures that employees do not smoke in work areas where they are occupationally exposed to asbestos because of activities in that work area.</p>



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<p><b>CA.120</b>  <b>COMMUNICATION OF HAZARDS</b></p> <p><b>CA.120.1.</b> Communications regarding installed asbestos containing building material must satisfy certain requirements (29 CFR 1926.1101(k)(1)).</p> <p><b>CA.120.2.</b> Building and facility owners must meet certain obligations (29 CFR 1926.1101(k)(2)).</p>	<p>(NOTE: The requirements of CA.120 apply to the communication of information concerning asbestos hazards in construction activities to facilitate compliance with this chapter. Most asbestos-related construction activities involve previously installed building materials. Building owners often are the only and/or best sources of information concerning them. Therefore, they, along with employers of potentially exposed employees, are assigned specific information conveying and retention duties.)</p> <p>Verify that employers and building owners identify TSI and sprayed or troweled on surfacing materials in buildings as asbestos-containing.</p> <p>(NOTE: This requirement does not apply if it has been determined (in compliance with the requirements to rebut the designation as PACM) that the material is not asbestos-containing.)</p> <p>(NOTE: Asphalt and vinyl flooring material installed no later than 1980 is also considered as asbestos containing unless an industrial hygienist determines that it is not asbestos-containing.)</p> <p>Verify that, if the employer/building owner has actual knowledge, or should have known through the exercise of due diligence, that other materials are asbestos-containing, they too are treated as such.</p> <p>Verify that, when communicating information to employees pursuant to this chapter, owners and employers identify PACM as ACM.</p> <p>(NOTE Additional requirements relating to communication of asbestos work on multi-employer worksites are set out in 29 CFR 1926.1101(d) (see checklist item CA.20).)</p> <p>Verify that, before work subject to this chapter is begun, building and facility owners determine the presence, location, and quantity of ACM and/or PACM at the worksite pursuant to 29 CFR 1926.1101(k)(1) (see checklist item CA.120.1).</p> <p>Verify that building and/or facility owners notify the following persons of the presence, location and quantity of ACM or PACM, at the work sites in their buildings and facilities:</p> <ul style="list-style-type: none"> <li>- prospective employers applying or bidding for work whose employees reasonably can be expected to work in or adjacent to areas containing such material</li> <li>- employees of the owner who will work in or adjacent to areas containing such material</li> </ul>

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<p><b>CA.120.3.</b> Employers whose employees perform work in or adjacent to areas containing ACM and PACM must meet certain obligations (29 CFR 1926.1101(k)(3)).</p>	<ul style="list-style-type: none"> <li>- on multi-employer worksites, all employers of employees who will be performing work within or adjacent to areas containing such materials</li> <li>- tenants who will occupy areas containing such material.</li> </ul> <p>Verify that notification is either in writing or consists of a personal communication between the owner and the person to whom notification must be given or their authorized representatives.</p> <p>(NOTE: Building/facility owners whose employees perform work subject to this chapter in or adjacent to areas containing ACM and PACM must comply with the provisions of this checklist item to the extent applicable.)</p> <p>Verify that, before work in areas containing ACM and PACM is begun, employers identify the presence, location, and quantity of ACM, and/or PACM therein pursuant to 29 CFR 1926.1101(k)(1) (see checklist item CA.120.1).</p> <p>Verify that before work under this chapter is performed, employers of employees who will perform such work inform the following persons of the location and quantity of ACM and/or PACM present in the area and the precautions to be taken to ensure that airborne asbestos is confined to the area:</p> <ul style="list-style-type: none"> <li>- owners of the building/facility</li> <li>- employees who will perform such work and employers of employees who work and/or will be working in adjacent areas.</li> </ul> <p>Verify that, within 10 days of the completion of such work, the employer whose employees have performed work subject to this chapter inform the building/facility owner and employers of employees who will be working in the area of the following:</p> <ul style="list-style-type: none"> <li>- current location and quantity of PACM and/or ACM remaining in the area</li> <li>- final monitoring results, if any.</li> </ul> <p><b>CA.120.4.</b> The presence of newly discovered ACM and PACM must be communicated within 24- h of the discovery (29 CFR 1926.1101(k)(4)).</p> <p>Verify that all employers who discover ACM and/or PACM on a worksite convey information concerning the presence, location and quantity of such newly discovered ACM and/or PACM to the owner and to other employers of employees working at the work site, within 24-h of the discovery.</p> <p>(NOTE: This requirement is in addition to the other notification requirements above.)</p>

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<b>CA.120.5.</b> Certain criteria must be satisfied in order to rebut the designation of installed material as PACM (29 CFR 1926.1101(k)(5)).	<p>(NOTE: At any time, an employer and/or building owner may demonstrate, for purposes of this chapter, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of 29 CFR 1926.1101(k)(5)(ii) (see checklist item CA.120.5) has been made.)</p> <p>Verify that the information, data, and analysis supporting the determination that PACM does not contain asbestos is retained for as long as it is relied upon to rebut the presumption.</p> <p>Verify that an employer or owner demonstrates that PACM does not contain more than 1 percent asbestos by either of the following:</p> <ul style="list-style-type: none"> <li>- having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR Part 763, Subpart E) which demonstrates that the material is not ACM or</li> <li>- performing tests of the material containing PACM which demonstrate that no ACM is present in the material.</li> </ul> <p>Verify that, if the demonstration is made by testing:</p> <ul style="list-style-type: none"> <li>- such tests include analysis of bulk samples collected in the manner described in 40 CFR 763.86</li> <li>- the tests, evaluation and sample collection are conducted by an accredited inspector or by a CIH</li> <li>- analysis of samples is performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.</li> </ul> <p>Verify that the employer and/or building owner demonstrates that flooring material including associated mastic and backing does not contain asbestos by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.</p>
<b>CA.120.6.</b> Building owners must post informational signs at the entrance to certain mechanical rooms/areas (29 CFR 1926.1101(k)(6)).	<p>Verify that, at the entrance to mechanical rooms/areas in which employees reasonably can be expected to enter and which contain ACM and/or PACM, the building owner posts signs which identify the material which is present, its location, and appropriate work practices which, if followed, will ensure that ACM and/or PACM will not be disturbed.</p>

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<p><b>CA.120.7.</b> Building owners must post warning signs that demarcate the regulated area (29 CFR 1926.1101(k)(7)(i) and (iii)).</p> <p><b>CA.120.8.</b> Warning signs must satisfy certain requirements (29 CFR 1926.1101(k)(7)(ii)).</p> <p><b>CA.120.9.</b> Labels must be affixed to asbestos containing products and containers (29 CFR 1926.1101(k)(8)(i) and (vi)).</p>	<p>Verify that the employer ensures, to the extent feasible, that employees who come in contact with these signs can comprehend them.</p> <p>(NOTE: Means to ensure employee comprehension may include the use of foreign languages, pictographs, graphics, and awareness training.)</p> <p>Verify that warning signs that demarcate the regulated area are provided and displayed at each location where a regulated area is required to be established.</p> <p>Verify that signs are posted at such a distance from such a location that an employee may read the signs and take necessary protective steps before entering the area marked by the signs.</p> <p>Verify that the employer ensures that employees working in and contiguous to regulated areas comprehend the warning signs required to be posted.</p> <p>(NOTE: Means to ensure employee comprehension may include the use of foreign languages, pictographs and graphics.)</p> <p>Verify that the warning signs bear the following information:</p> <p style="text-align: center;">DANGER  ASBESTOS  CANCER AND LUNG DISEASE HAZARD  AUTHORIZED PERSONNEL ONLY</p> <p>Verify that, where the use of respirators and protective clothing is required in the regulated area, the warning signs include the following:</p> <p style="text-align: center;">RESPIRATORS AND PROTECTION CLOTHING  ARE REQUIRED IN THIS AREA</p> <p>Verify that labels are affixed to all products containing asbestos and to all containers containing such products, including waste containers.</p> <p>Verify that, where feasible, installed asbestos products contain a visible label.</p> <p>(NOTE: These provisions for labels do not apply where:</p> <ul style="list-style-type: none"> <li>- asbestos fibers have been modified by a bonding agent, coating, binder, or other material, provided that the manufacturer can demonstrate that, during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the permissible exposure limit and/or excursion limit will be released</li> <li>- asbestos is present in a product in concentrations less than 1.0 percent.)</li> </ul>

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<b>CA.120.10.</b> Labels must satisfy certain requirements (29 CFR 1926.1101 (k)(8)(ii) through (v)).	<p>Verify that labels are printed in large, bold letters on a contrasting background.</p> <p>Verify that labels are used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard.</p> <p>Verify that labels contain the following information:</p> <p style="text-align: center;">DANGER  CONTAINS ASBESTOS FIBERS  AVOID CREATING DUST  CANCER AND LUNG DISEASE HAZARD</p> <p>Verify that labels contain a warning statement against breathing asbestos fibers.</p>
<b>CA.120.11.</b> Building owners or employers must post signs or affix labels to identify previously installed PACM and/or ACM (29 CFR 1926.1101(k)(8)(vii)).	<p>Verify that, when a building owner or employer identifies previously installed PACM and/or ACM, labels or signs are affixed or posted so that employees will be notified of what materials contain PACM and/or ACM.</p> <p>Verify that the employer attaches such labels in areas where they will clearly be noticed by employees who are likely to be exposed, such as at the entrance to mechanical room/areas.</p> <p>(NOTE: Signs required to be posted at the entrance of mechanical rooms/areas may be posted in lieu of labels so long as they contain information required for labeling.)</p> <p>Verify that the employer ensures, to the extent feasible, that employees who come in contact with these signs or labels can comprehend them.</p> <p>(NOTE: Means to ensure employee comprehension may include the use of foreign languages, pictographs, graphics, and awareness training.)</p>
<b>CA.120.12.</b> Employers must provide training to certain employees (29 CFR 1926.1101(k)(9)(i) and (k)(9)(ii)).	<p>Verify that the employer, at no cost to the employee, institutes a training program for all employees who are likely to be exposed in excess of an OEL and for all employees who perform Class I through IV asbestos operations.</p> <p>Verify that the employer ensures such employees' participation in the program.</p> <p>Verify that training is provided prior to or at the time of initial assignment and at least annually thereafter.</p>
<b>CA.120.13.</b> Training for Class I operations and some Class II operations must satisfy certain requirements (29 CFR 1926.1101(k)(9)(iii)).	<p>Verify that training for Class I operations and for Class II operations that require the use of critical barriers (or equivalent isolation methods) and/or negative pressure enclosures under this chapter is the equivalent in curriculum, training method and length to the EPA Model Accreditation Plan (MAP) asbestos abatement workers training (40 CFR Part 763, Subpart E, Appendix C).</p>

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<p><b>CA.120.14.</b> Training for other Class II work must satisfy certain requirements (29 CFR 1926.1101(k)(9)(iv)).</p>	<p>Determine whether work is being performed with the following asbestos containing materials:</p> <ul style="list-style-type: none"> <li>- roofing materials</li> <li>- flooring materials</li> <li>- siding materials</li> <li>- ceiling tiles</li> <li>- transite panels.</li> </ul> <p>Verify that, for such work, training includes at a minimum:</p> <ul style="list-style-type: none"> <li>- all the elements included in 29 CFR 1926.1101(k)(9)(viii) (see checklist item CA.120.17)</li> <li>- the specific work practices and engineering controls set forth in 29 CFR 1926.1101(g) (see the checklist items in CA.50, CA.60, CA.70, and CA.80) which specifically relate to that category.</li> </ul> <p>Verify that such course includes "hands-on" training and takes at least 8 h.</p> <p>Verify that an employee who works with more than one of the categories of material specified in this checklist item receives training in the work practices applicable to each category of material that the employee removes and each removal method that the employee uses.</p> <p>Verify that, for Class II operations not involving the categories of material specified above in this checklist item, training is provided which includes at a minimum:</p> <ul style="list-style-type: none"> <li>- all the elements included in 29 CFR 1926.1101(k)(9)(viii) (see checklist item CA.120.17)</li> <li>- the specific work practices and engineering controls set forth in 29 CFR 1926.1101(g) (see the checklist items in CA.50, CA.60, CA.70, and CA.80) which specifically relate to the category of material being removed</li> <li>- "hands-on" training in the work practices applicable to each category of material that the employee removes and each removal method that the employee uses.</li> </ul>
<p><b>CA.120.15.</b> Training for Class III work must satisfy certain requirements (29 CFR 1926.1101(k)(9)(v)).</p>	<p>Verify that training for Class III employees is consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92(a)(2).</p> <p>Verify that such a course also includes "hands-on" training and takes at least 16 h.</p>

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<p><b>CA.120.16.</b> Training for Class IV work must satisfy certain requirements (29 CFR 1926.1101(k)(9)(vi)).</p> <p><b>CA.120.17.</b> Employees who are likely to be exposed in excess of the OEL and are not other-wise required to be trained must be trained in accordance with certain requirements (1926.1101(k)(9)(vii) and (viii)).</p>	<p>Verify that, for Class III operations for which the competent person determines that the EPA curriculum does not adequately cover the training needed to perform that activity, training includes as a minimum:</p> <ul style="list-style-type: none"> <li>- all the elements included in 29 CFR 1926.1101(k)(9)(viii) (see checklist item CA.120.17)</li> <li>- the specific work practices and engineering controls set forth in 29 CFR 1926.1101(g) (see the checklist items in CA.50, CA.60, CA.70, and CA.80) which specifically relate to that activity</li> <li>- "hands-on" training in the work practices applicable to each category of material that the employee disturbs.</li> </ul> <p>Verify that training for employees performing Class IV operations is consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92(a)(1).</p> <p>Verify that such a course includes:</p> <ul style="list-style-type: none"> <li>- available information concerning the locations of thermal system insulation and surfacing ACM/PACM, and asbestos-containing flooring material, or flooring material where the absence of asbestos has not yet been certified</li> <li>- instruction in recognition of damage, deterioration, and delamination of asbestos containing building materials.</li> </ul> <p>Verify that such a course takes at least 2 hr.</p> <p>Determine whether employees are likely to be exposed in excess of the OEL and are not otherwise required to be trained under 29 CFR 1926.1101(k)(9)(iii) through (vi) (see checklist items CA.120.13 through CA.120.16).</p> <p>Verify that the training program is conducted in a manner that the employee is able to understand.</p> <p>Verify that, in addition to the content required by provisions in 29 CFR 1926.1101(k)(9)(iii) through (vi) (see checklist items CA.120.13 through CA.120.16), the employer ensures that each such employee is informed of the following:</p> <ul style="list-style-type: none"> <li>- methods of recognizing asbestos, including the requirement in 29 CFR 1926.1101(k)(1) (see checklist item CA.120.1) to presume that certain building materials contain asbestos</li> <li>- the health effects associated with asbestos exposure</li> <li>- the relationship between smoking and asbestos in producing lung cancer</li> <li>- the nature of operations that could result in exposure to asbestos</li> </ul>

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<p><b>CA.120.18.</b> Employers must make certain training materials accessible (29 CFR 1926.1101 (k)(10)).</p>	<ul style="list-style-type: none"> <li>- the importance of necessary protective controls to minimize exposure including, as applicable:               <ul style="list-style-type: none"> <li>- engineering controls</li> <li>- work practices</li> <li>- respirators</li> <li>- housekeeping procedures</li> <li>- hygiene facilities</li> <li>- protective clothing</li> <li>- decontamination procedures</li> <li>- emergency procedures</li> <li>- waste disposal procedures</li> </ul> </li> <li>- any necessary instruction in the use of these controls and procedures</li> <li>- where Class III and IV work will be or is performed, the contents of EPA 20T- 2003, "Managing Asbestos In-Place" July 1990 or its equivalent in content</li> <li>- the purpose, proper use, fitting instructions, and limitations of respirators as required by 29 CFR 1910.134 (see the checklist items in PE.30 through PE.120)</li> <li>- the appropriate work practices for performing the asbestos job</li> <li>- medical surveillance program requirements</li> <li>- the content of 29 CFR 1926.1101 including appendices</li> <li>- the names, addresses and phone numbers of public health organizations which provide information, materials and/or conduct programs concerning smoking cessation (NOTE: The employer may distribute the list of such organizations contained in Appendix J of 29 CFR 1926.1101 to comply with this requirement.)</li> <li>- the requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels.</li> </ul> <p>Verify that the employer makes readily available to affected employees, without cost, written materials relating to the employee training program, including a copy of 29 CFR 1910.1101.</p> <p>Verify that the employer provides to the Assistant Secretary and the Director, upon request, all information and training materials relating to the employee information and training program.</p> <p>Verify that the employer informs all employees concerning the availability of self-help smoking cessation program material.</p> <p>Verify that, upon employee request, the employer distributes such material, consisting of NIH Publication No. 89-1647, or equivalent self-help material, which is approved or published by a public health organization listed in Appendix J of 29 CFR 1926.1101.</p>

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<p><b>CA.130</b>  <b>HOUSEKEEPING</b></p> <p><b>CA.130.1.</b> Vacuuming must satisfy certain requirements (29 CFR 1926.1101(l)(1)).</p> <p><b>CA.130.2.</b> Waste disposal must satisfy certain requirements (29 CFR 1926.1101(l)(2)).</p> <p><b>CA.130.3.</b> Asbestos-containing flooring materials must be cared for in accordance with certain requirements (29 CFR 1926.1101(l)(3)).</p>	<p>Verify that, where vacuuming methods are selected, HEPA filtered vacuuming equipment is used.</p> <p>Verify that the equipment is used and emptied in a manner that minimizes the reentry of asbestos into the workplace.</p> <p>Verify that the following are collected and disposed of in sealed, labeled, impermeable bags or other closed, labeled, impermeable containers:</p> <ul style="list-style-type: none"> <li>- asbestos waste</li> <li>- scrap</li> <li>- debris</li> <li>- bags</li> <li>- containers</li> <li>- equipment</li> <li>- contaminated clothing consigned for disposal.</li> </ul> <p>(NOTE: This requirement does not apply in roofing operations where the procedures specified in paragraph 29 CFR 1926.1101(g)(8)(ii) (see checklist item CA.60.3) apply.)</p> <p>Verify that all vinyl and asphalt flooring material is maintained in accordance with this checklist item unless the building/facility owner demonstrates, pursuant to 29 CFR 1926.1101(g)(8)(i)(I) (see checklist item CA.60.2) that the flooring does not contain asbestos.</p> <p>Verify that no sanding of flooring material occurs.</p> <p>Verify that stripping of finishes is conducted using low abrasion pads at speeds lower than 300 rpm and wet methods.</p> <p>Verify that burnishing or dry buffing is performed only on flooring which has sufficient finish so that the pad cannot contact the flooring material.</p>

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<b>CA.130.4.</b> Waste and debris and accompanying dust in an area containing accessible TSI or surfacing ACM/PACM or visibly deteriorated ACM must be cleaned up in accordance with certain requirements (29 CFR 1926.1101(l)(4)).	Verify that waste and debris and accompanying dust in an area containing accessible TSI or surfacing ACM/PACM or visibly deteriorated ACM: <ul style="list-style-type: none"> <li>- is not dusted or swept dry, or vacuumed without using a HEPA filter</li> <li>- is promptly cleaned up and disposed of in leak tight containers.</li> </ul>

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<b>CA.140 MEDICAL SURVEILLANCE</b>	<p>Verify that the employer institutes a medical surveillance program for all employees who, for a combined total of 30 or more days per year, are engaged in Class I, II, and III work or are exposed at or above a permissible exposure limit.</p> <p>(NOTE: For purposes of these medical surveillance requirements, any day in which a worker engages in Class II or Class III operations or a combination thereof on intact material for 1 h or less (taking into account the entire time spent on the removal operation, including cleanup) and, while doing so, adheres fully to the work practices specified in this chapter, is not counted.)</p> <p>Verify that, for employees otherwise required by this chapter to wear a negative pressure respirator, employers ensure employees are physically able to perform the work and use the equipment.</p> <p>Verify that this determination is made under the supervision of a physician.</p> <p>Verify that the employer ensures that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and are provided at no cost to the employee and at a reasonable time and place.</p> <p>Verify that persons other than such licensed physicians who administer the pulmonary function testing required by this chapter complete a training course in spirometry sponsored by an appropriate academic or professional institution.</p>
<b>CA.140.2.</b> Medical examinations and consultations must satisfy certain requirements (29 CFR 1926.1101(m)(2)).	<p>Determine whether an employee is either:</p> <ul style="list-style-type: none"> <li>- engaged in Class I, II, and III work for a combined total of 30 or more days per year</li> <li>- exposed at or above a permissible exposure limit</li> <li>- required to wear a negative pressure respirator.</li> </ul> <p>Verify that the employer makes available medical examinations and consultations to each such employee on the following schedules:</p> <ul style="list-style-type: none"> <li>- prior to assignment of the employee to an area where negative-pressure respirators are worn</li> <li>- when the employee is assigned to an area where exposure to asbestos may be at or above the permissible exposure limit for 30 or more days per year, or engage in Class I, II, or III work for a combined total of 30 or more days per year, a medical examination must be given within 10 working days following the 30th day of exposure</li> </ul>

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<p><b>CA.140.3.</b> Employers must provide certain information to the examining physician (29 CFR 1926.1101(m)(3)).</p>	<ul style="list-style-type: none"> <li>- at least annually thereafter</li> <li>- if the examining physician determines that any of the examinations should be provided more frequently than specified, the employer shall provide such examinations to affected employees at the frequencies specified by the physician.</li> </ul> <p>(NOTE: No medical examination is required of any employee if adequate records show that the employee has been examined in accordance with this checklist item within the past 1-yr period.</p> <p>Verify that these medical examinations include:</p> <ul style="list-style-type: none"> <li>- a medical and work history with special emphasis directed to the pulmonary, cardiovascular, and gastrointestinal systems</li> <li>- on initial examination, the standardized questionnaire contained in Part 1 of Appendix D to 29 CFR 1926.1101, and, on annual examination, the abbreviated standardized questionnaire contained in Part 2 of Appendix D to 29 CFR 1926.1101</li> <li>- a physical examination directed to the pulmonary and gastrointestinal systems, including a chest roentgenogram to be administered at the discretion of the physician, and pulmonary function tests of forced vital capacity (FVC) and forced expiratory volume at 1 s (FEV(1))</li> <li>- any other examinations or tests deemed necessary by the examining physician.</li> </ul> <p>(NOTE: Interpretation and classification of chest roentgenograms must be conducted in accordance with Appendix E to 29 CFR 1926.1101.)</p> <p>Verify that the employer provides the following information to the examining physician:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1926.1101 and Appendices D, E, and I to 29 CFR 1926.1101</li> <li>- a description of the affected employee's duties as they relate to the employee's exposure</li> <li>- the employee's representative exposure level or anticipated exposure level</li> <li>- a description of any personal protective and respiratory equipment used or to be used</li> <li>- information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.</li> </ul>

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<p><b>CA.140.4.</b> Employers must obtain from the examining physician a written opinion that meets certain requirements (29 CFR 1926.1101(m)(4)(i) and (ii)).</p>	<p>Verify that the employer obtains a written opinion from the examining physician.</p> <p>Verify that this written opinion contains the results of the medical examination and includes:</p> <ul style="list-style-type: none"> <li>- the physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of material health impairment from exposure to asbestos</li> <li>- any recommended limitations on the employee or on the use of personal protective equipment such as respirators</li> <li>- a statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure</li> <li>- a statement that the employee has been informed by the physician of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure.</li> </ul> <p>Verify that the employer instructs the physician not to reveal in the written opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to asbestos.</p>
<p><b>CA.140.5.</b> Employers must provide a copy of the physician's written opinion to the affected employee within 30 days from its receipt (29 CFR 1926.1101(m)(4)(iii)).</p>	<p>Verify that the employer provides a copy of the physician's written opinion to the affected employee within 30 days from its receipt.</p>



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<p><b>CA.150</b>  <b>RECORDKEEPING</b></p> <p><b>CA.150.1.</b> Records regarding objective data relied on in performing exposure assessments must satisfy certain requirements (29 CFR 1926.1101(n)(1)).</p> <p><b>CA.150.2.</b> Exposure monitoring records must be maintained in accordance with certain requirements (29 CFR 1926.1101(n)(2)).</p>	<p>Determine whether the employer has relied on objective data that demonstrates that products made from or containing asbestos, or the activity involving such products or material, are not capable of releasing fibers of asbestos in concentrations at or above the permissible exposure limit and/or excursion limit under the expected conditions of processing, use, or handling to satisfy the exposure assessments and monitoring requirements of 29 CFR 1926.1101(f) (see the checklist items in CA.40).</p> <p>Verify that the employer establishes and maintains an accurate record of objective data reasonably relied upon in support of the exemption.</p> <p>Verify that the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the product qualifying for exemption</li> <li>- the source of the objective data</li> <li>- the testing protocol, results of testing, and/or analysis of the material for the release of asbestos</li> <li>- a description of the operation exempted and how the data support the exemption</li> <li>- other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.</li> </ul> <p>Verify that the employer maintains this record for the duration of the employer's reliance upon such objective data.</p> <p>Verify that the employer keeps an accurate record of all measurements taken to monitor employee exposure to asbestos as prescribed in 29 CFR 1926.1101(f) (see the checklist items in CA.40).</p> <p>(NOTE: The employer may utilize the services of competent organizations such as industry trade associations and employee associations to maintain the required records.)</p> <p>Verify that this record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the date of measurement</li> <li>- the operation involving exposure to asbestos that is being monitored</li> <li>- sampling and analytical methods used and evidence of their accuracy</li> <li>- number, duration, and results of samples taken</li> <li>- type of protective devices worn, if any</li> <li>- name, social security number, and exposure of the employees whose exposures are represented.</li> </ul>

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<p><b>CA.150.3.</b> Medical surveillance records must be maintained according to certain requirements (29 CFR 1926.1101(n)(3)).</p>	<p>Verify that the employer maintains this record for at least 30 yr.</p> <p>Verify that the employer establishes and maintains an accurate record for each employee who is subject to asbestos related medical surveillance, in accordance with 29 CFR 1910.1020 (see the checklist items in RK.60).</p> <p>Verify that the record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the employee</li> <li>- a copy of the employee's medical examination results, including the medical history, questionnaire responses, results of any tests, and physician's recommendations</li> <li>- physician's written opinions</li> <li>- any employee medical complaints related to exposure to asbestos</li> <li>- a copy of the information provided to the physician in accordance with 29 CFR 1926.1101(m) (see the checklist items in CA.140).</li> </ul> <p>Verify that the employer ensures that this record is maintained for the duration of employment plus 30 yr.</p>
<p><b>CA.150.4.</b> Training records must be maintained for 1 year beyond the last date of employment by that employer (29 CFR 1926.1101(n)(4)).</p>	<p>Verify that the employer maintains all employee training records for 1 year beyond the last date of employment by that employer.</p>
<p><b>CA.150.5.</b> Data to rebut the status as PACM must be maintained for as long as it is relied upon to rebut the presumption (29 CFR 1926.1101(n)(5)).</p>	<p>Verify that, where the building owner and employer have relied on data to demonstrate that PACM is not asbestos-containing, such data is maintained for as long as it is relied upon to rebut the presumption.</p>
<p><b>CA.150.6.</b> Records of required notifications must be maintained by the building owner for the duration of ownership and must be transferred to successive owners of such buildings/facilities (29 CFR 1926.1101(n)(6)).</p>	<p>Verify that, where the building owner has communicated and received information concerning the identification, location and quantity of ACM and PACM, written records of such notifications and their content are maintained by the building owner for the duration of ownership and are transferred to successive owners of such buildings/facilities.</p>

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<p><b>CA.150.7.</b> Records must be made available according to certain requirements (29 CFR 1926.1101(n)(7)).</p>	<p>Verify that the employer, upon written request, makes all required records available to the Assistant Secretary and the Director for examination and copying.</p> <p>Verify that the employer, upon request, makes any exposure records required by 29 CFR 1926.1101(f) and (n) (see the checklist items in CA.40 and CA.150) available for examination and copying to affected employees, former employees, designated representatives, and the Assistant Secretary.</p> <p>(NOTE: 29 CFR 1910.1020(a) through (e) and (g) through (i) contain further requirements regarding access to employee exposure and medical records.)</p> <p>Verify that the employer, upon request, makes employee medical records required by 29 CFR 1926.1101(m) and (n) (see the checklist items in CA.140 and CA.150) available for examination and copying to:</p> <ul style="list-style-type: none"> <li>- the subject employee</li> <li>- anyone having the specific written consent of the subject employee</li> <li>- the Assistant Secretary.</li> </ul>
<p><b>CA.150.8.</b> Transfer of records must meet specific requirements (29 CFR 1926.1101(n)(8)).</p>	<p>Verify that, in the event of personnel reassignment, all monitoring records accompany affected personnel and are retained by the new installation.</p> <p>Verify that, in the event of installation closure, all records required by this chapter are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.</p>



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<p><b>CA.160</b>  <b>COMPETENT PERSONS</b></p> <p><b>CA.160.1.</b> The employer must designate a competent person on all construction work sites covered by 29 CFR 1926.1101(29 CFR 1926.1101(o)(1)).</p> <p><b>CA.160.2.</b> Employers must initiate a health and safety prevention program which provides for frequent and regular inspections (29 CFR 1926.1101(o)(2) and 29 CFR 1926.20(b)(2)).</p> <p><b>CA.160.3.</b> The competent person must perform inspections which satisfy certain requirements (29 CFR 1926.1101(o)(3)).</p>	<p>Verify that, on all construction worksites covered by this chapter, the employer designates a competent person, having the qualifications and authorities for ensuring worker safety and health required by Subpart C, General Safety and Health Provisions for Construction (29 CFR 1926.20 through 1926.32).</p> <p>Verify that the employer initiates a health and safety prevention program that provides for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons.</p> <p>Verify that the competent person makes frequent and regular inspections of the job sites, in order to perform the duties set out in this checklist item.</p> <p>Verify that, for Class I jobs, on-site inspections are made at least once during each work shift, and at any time at employee request.</p> <p>Verify that, for Class II, III, and IV jobs, on-site inspections are made at intervals sufficient to assess whether conditions have changed, and at any reasonable time at employee request.</p> <p>Verify that, on all worksites where employees are engaged in Class I or II asbestos work, the designated competent person sets up:</p> <ul style="list-style-type: none"> <li>- the regulated area, enclosure, or other containment</li> <li>- procedures to control entry to and exit from the enclosure and/or area.</li> </ul> <p>Verify that, on all worksites where employees are engaged in Class I or II asbestos work, the designated competent person supervises all required employee exposure monitoring and ensures that it is conducted as required by 29 CFR 1926.1101(f) (see the checklist items in CA.40).</p> <p>Verify that, on all worksites where employees are engaged in Class I or II asbestos work, the designated competent person ensures:</p> <ul style="list-style-type: none"> <li>- by on-site inspection, the integrity of the enclosure or containment</li> <li>- that employees working within the enclosure and/or using glove bags wear respirators and protective clothing as required by 29 CFR 1926.1101(h) and</li> </ul>

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<p><b>CA.160.4.</b> Training for the competent person must satisfy certain requirements (29 CFR 1926.1101(o)(4)).</p>	<ul style="list-style-type: none"> <li>(i) (see checklist items in CA.90 and CA.100)</li> <li>- through on-site supervision, that employees set up, use and remove engineering controls, use work practices and personal protective equipment in compliance with all requirements</li> <li>- that employees use the hygiene facilities and observe the decontamination procedures specified in 29 CFR 1926.1101(j) (see the checklist items in CA.110)</li> <li>- through on-site inspection, engineering controls are functioning properly and employees are using proper work practices</li> <li>- that notification requirement in 29 CFR 1926.1101(k) (see the checklist items in CA.120) are met.</li> </ul> <p>Verify that, for Class I and II asbestos work, the competent person is trained in all aspects of asbestos removal and handling, including:</p> <ul style="list-style-type: none"> <li>- abatement, installation, removal and handling</li> <li>- the contents of 29 CFR 1926.1101</li> <li>- the identification of asbestos</li> <li>- removal procedures, where appropriate</li> <li>- other practices for reducing the hazard.</li> </ul> <p>Verify that such training is obtained in a comprehensive course for supervisors that meets the criteria of EPA's Model Accredited Plan (40 CFR part 763, subpart E, Appendix C), such as a course conducted by an EPA-approved or state-approved training provider, certified by EPA or a state, or a course equivalent in stringency, content, and length.</p> <p>Verify that, for Class III and IV asbestos work, the competent person is trained in aspects of asbestos handling appropriate for the nature of the work, to include:</p> <ul style="list-style-type: none"> <li>- procedures for setting up glove bags and mini-enclosures</li> <li>- practices for reducing asbestos exposures</li> <li>- use of wet methods</li> <li>- the contents of 29 CFR 1926.1101</li> <li>- the identification of asbestos.</li> </ul> <p>Verify that such training includes successful completion of a course that is consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92(a)(2), or its equivalent in stringency, content, and length.</p> <p>(NOTE: Competent persons for Class III and IV work may also be trained pursuant to the requirements for Class I and II asbestos work.)</p>

## Appendix 36-1

### Respiratory Protection for Asbestos Fibers (29 CFR 1926.1101, Table 1)

Airborne concentration of asbestos or conditions of use	Required respirator
Not in excess of 1 f/cc (10 X OEL), or otherwise as required independent of exposure pursuant to 29 CFR 1926.1101(h)(2)(iv) (see checklist item CA.90.4.)	Half-mask air purifying respirator other than a disposable respirator, equipped with high efficiency filters
Not in excess of 5 f/cc (50 X OEL)	Full facepiece air-purifying respirator equipped with high efficiency filters
Not in excess of 10 f/cc (100 X OEL)	Any powered air-purifying respirator equipped with high efficiency filters or any supplied air respirator operated in continuous flow mode
Not in excess of 100 f/cc (1000 X OEL)	Full facepiece supplied air respirator operated in pressure demand mode
Greater than 100 f/cc (1000 X OEL) or unknown concentration	Full facepiece supplied respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus

#### Notes:

- Respirators assigned for high environmental concentrations may be used at lower concentrations, or when required respirator use is independent of concentration.
- A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3  $\mu\text{m}$  in diameter or larger.



## **CHAPTER 37**

### **LEAD -- CONSTRUCTION**

## CHAPTER 37

### EOH: LEAD -- CONSTRUCTION

#### ECAMP-ANG

September 1997

#### Applicability

This chapter applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead (see Chapter 26: Lead) is covered by this chapter. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

1. demolition or salvage of structures where lead or materials containing lead are present
2. removal or encapsulation of materials containing lead
3. new construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead
4. installation of products containing lead
5. lead contamination/emergency cleanup
6. transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed
7. maintenance operations associated with the construction activities described in this list.

#### Compliance Definitions

- *Action Level* - employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air ( $30 \mu\text{g}/\text{m}^3$ ) calculated as an 8-h time-weighted average (TWA) (29 CFR 1926.62(b)).
- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee (29 CFR 1926.62(b)).
- *Competent Person* - one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them (29 CFR 1926.62(b)).
- *Director* - the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee (29 CFR 1926.62(b)).
- *Final Medical Determination* - the written medical opinion on the employees' health status by the examining physician or, where relevant, the outcome of the multiple physician review mechanism or alternate medical determination mechanism used pursuant to the medical surveillance provisions (29 CFR 1926.62(k)(ii)(B)).
- *Lead* - metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds (29 CFR 1926.62(b)).
- *Objective Data* - information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials. The data the employer uses from an industry-wide survey must be obtained under workplace conditions closely resembling

the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations (29 CFR 1926.62(4)(i)).

- *Occupational Exposure Limit (OEL)* - the limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentration, that apply to a specific substance. for each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-h work shift except where 29 CFR 1910 Subpart Z allows for 40-h averages. Exposure during work shifts that exceed 8 h must be adjusted before applying an OEL (AFOSH STD 48-8, Attachment 1).

# EOH: LEAD -- CONSTRUCTION

## GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
Occupational Exposure Limits (OELs)	CL.10.1	37-5
Exposure Assessment	CL.20.1 through CL.20.13	37-7
Methods of Compliance	CL.30.1 through CL.30.5	37-13
Respiratory Protection	CL.40.1 through CL.40.4	37-15
Protective Work Clothing and Equipment	CL.50.1 and CL.50.2	37-17
Housekeeping	CL.60.1 and CL.60.2	37-19
Hygiene Facilities and Practices	CL.70.1 through CL.70.7	37-21
Medical Surveillance	CL.80.1 through CL.80.9	37-23
Medical Removal Protection	CL.90.1 through CL.90.3	37-29
Employee Information and Training	CL.100.1 through CL.100.4	37-33
Signs	CL.110.1	37-35
Recordkeeping	CL.120.1 through CL.120.6	37-37
Observation of Monitoring	CL.130.1 and CL.130.2	37-41

Appendix 37-1, *Respiratory Protection for Lead Aerosols*

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<p><b>CL.10</b>  <b>OCCUPATIONAL EXPOSURE LIMITS (OELs)</b></p> <p><b>CL.10.1.</b> Employers must ensure that employees are not exposed to excessive concentrations of lead (29 CFR 1926.62(c)).</p>	<p>Verify that the employer ensures that no employee is exposed to lead at concentrations greater than <math>50 \mu\text{g}/\text{m}^3</math> of air averaged over an 8-h period.</p> <p>Verify that, if an employee is exposed to lead for more than 8-h in any work day the employees' allowable exposure, as a TWA for that day, is reduced according to the following formula:</p> <p style="text-align: center;">Allowable employee exposure (in <math>\mu\text{g}/\text{m}^3</math>) = 400 divided by hours worked in the day.</p> <p>(NOTE: When respirators are used to limit employee exposure and all the requirements of 29 CFR 1926.62(e)(1) and (f) (see checklist items CL.30.1 and the checklist items in CL.40) have been met, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.)</p>



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<p><b>CL.20 EXPOSURE ASSESSMENT</b></p> <p><b>CL.20.1.</b> Employers must establish whether any employee might be exposed to lead at or above the action level (29 CFR 1926.62(d)(1)(i)).</p> <p><b>CL.20.2.</b> Employers must collect full shift personal samples (29 CFR 1926.62(d)(1)(iii) and (iv)).</p> <p><b>CL.20.3.</b> Employees must be treated as if they were exposed to lead in excess of the OEL under certain circumstances (29 CFR 1926.62(d)(2)(i) and (ii)).</p>	<p>(NOTE: For the purposes of 29 CFR 1926.62(d) (see the checklist items in CL.20), employee exposure is that exposure which would occur if the employee were not using a respirator.)</p> <p>Verify that each employer who has a workplace or operation covered by 29 CFR 1926.62 initially establishes whether any employee may be exposed to lead at or above the action level.</p> <p>Verify that, where monitoring is required, the employer collects personal samples representative of a full shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level.</p> <p>(NOTE: This requirement does not apply to monitoring covered under 29 CFR 1926.62(d)(3) (see checklist item CL.20.7.)</p> <p>Verify that full shift personal samples are representative of the monitored employee's regular, daily exposure to lead.</p> <p>Verify that, until the employer performs a required employee exposure assessment and documents that the employee performing any of the tasks listed below in this checklist item is not exposed above the OEL, the employer:</p> <ul style="list-style-type: none"> <li>- treats the employee as if the employee were exposed above the OEL, and not in excess of 10 times the OEL</li> <li>- implements interim employee protective measures.</li> </ul> <p>(NOTE: The tasks covered by this requirement are:</p> <ul style="list-style-type: none"> <li>- where lead containing coatings or paint are present: <ul style="list-style-type: none"> <li>- Manual demolition of structures (e.g., dry wall)</li> <li>- manual scraping</li> <li>- manual sanding</li> <li>- heat gun applications</li> <li>- power tool cleaning with dust collection systems</li> </ul> </li> <li>- spray painting with lead paint.)</li> </ul> <p>Determine whether the employer has any reason to believe that an employee performing the a task <u>not</u> listed above in this checklist item may be exposed to lead in excess of the OEL.</p> <p>Verify that, until the employer performs a required employee exposure assessment and documents that the employee's lead exposure is not above the OEL, the</p>

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<p><b>CL.20.4.</b> Employees must be treated as if they were exposed to lead in excess of 500 <math>\mu\text{g}/\text{m}^3</math> under certain circumstances (29 CFR 1926.62(d)(2)(iii)).</p>	<p>employer:</p> <ul style="list-style-type: none"> <li>- treats the employee as if the employee were exposed above the OEL</li> <li>- implements interim employee protective measures.</li> </ul> <p>Verify that, until the employer performs a required employee exposure assessment and documents that the employee performing any of the tasks listed below in this checklist item is not exposed in excess of 500 <math>\mu\text{g}/\text{m}^3</math>, the employer:</p> <ul style="list-style-type: none"> <li>- treats the employee as if the employee were exposed to lead in excess of 500 <math>\mu\text{g}/\text{m}^3</math></li> <li>- implements interim employee protective measures.</li> </ul> <p>(NOTE: Where the employer does establish that the employee is exposed to levels of lead below 500 <math>\mu\text{g}/\text{m}^3</math>, the employer may provide the exposed employee with the appropriate respirator prescribed for such use at such lower exposures.)</p> <p>(NOTE: The tasks covered by this requirement are:</p> <ul style="list-style-type: none"> <li>- using lead containing mortar; lead burning</li> <li>- where lead containing coatings or paint are present: <ul style="list-style-type: none"> <li>- rivet busting</li> <li>- power tool cleaning without dust collection systems</li> <li>- cleanup activities where dry expendable abrasives are used</li> </ul> </li> <li>- abrasive blasting enclosure movement and removal.)</li> </ul> <p><b>CL.20.5.</b> Employees must be treated as if they were exposed to lead in excess of 2500 <math>\mu\text{g}/\text{m}^3</math> under certain circumstances (29 CFR 1926.62(d)(2)(iv)).</p> <p>Verify that, until the employer performs a required employee exposure assessment and documents that the employee performing any of the tasks listed below in this checklist item is not exposed to lead in excess of 2500 <math>\mu\text{g}/\text{m}^3</math> (50 x OEL), the employer:</p> <ul style="list-style-type: none"> <li>- treats the employee as if the employee were exposed to lead in excess of 2500 <math>\mu\text{g}/\text{m}^3</math></li> <li>- implements interim employee protective measures.</li> </ul> <p>(NOTE: Where the employer does establish that the employee is exposed to levels of lead below 2500 <math>\mu\text{g}/\text{m}^3</math>, the employer may provide the exposed employee with the appropriate respirator prescribed for use at such lower exposures.)</p> <p>(NOTE: Interim protection is required where lead containing coatings or paint are present on structures when performing:</p> <ul style="list-style-type: none"> <li>- abrasive blasting</li> <li>- welding</li> <li>- cutting</li> <li>- torch burning.)</li> </ul>

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<p><b>CL.20.6.</b> Interim protection must satisfy certain requirements (29 CFR 1926.62(d)(2)(v)).</p> <p><b>CL.20.7.</b> Initial determinations, which are based on certain considerations, must be performed (29 CFR 1926.62(d)(3)).</p>	<p>Verify that, until the employer performs a required employee exposure assessment and determines actual employee exposure, the employer provides to employees performing the tasks described in 29 CFR 1926.62(d)(2)(i), (d)(2)(ii), (d)(2)(iii) and (d)(2)(iv) (see checklist items CL.20.3 through CL.20.5) with interim protection as follows:</p> <ul style="list-style-type: none"> <li>- appropriate respiratory protection</li> <li>- appropriate personal protective clothing and equipment</li> <li>- change areas</li> <li>- hand washing facilities</li> <li>- biological monitoring to consist of blood sampling and analysis for lead and zinc protoporphyrin levels</li> <li>- required training regarding 29 CFR 1926.59, Hazard Communication; respirator training; and training in accordance with 29 CFR 1926.21, Safety training and education.</li> </ul> <p>Verify that the employer monitors employee exposures and bases initial determinations on the employee exposure monitoring results and any of the following relevant considerations:</p> <ul style="list-style-type: none"> <li>- any information, observations, or calculations which would indicate employee exposure to lead</li> <li>- any previous measurements of airborne lead</li> <li>- any employee complaints of symptoms which may be attributable to exposure to lead.</li> </ul> <p>(NOTE: Monitoring for the initial determination, where performed, may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the work-place.)</p> <p>(NOTE: Where the employer has previously monitored for lead exposures, and the data were obtained within the past 12 mo during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy initial monitoring and frequency requirements if the sampling and analytical methods which have an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 <math>\mu\text{g}/\text{m}^3</math>.)</p> <p>(NOTE: Where the employer has objective data demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the action level during processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.)</p>

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<p><b>CL.20.8.</b> Representative monitoring must be performed after a positive initial determination and initial monitoring (29 CFR 1926.62(d)(4)).</p>	<p>Verify that, if objective data is used in assessing employee exposure in lieu of exposure monitoring, the employer establishes and maintains an accurate record documenting the nature and relevancy of objective data.</p> <p>(NOTE: Objective data, as described in this checklist item, is not permitted to be used for exposure assessment in connection with 29 CFR 1926.62(d)(2) (see check list items CL.20.3 through CL.20.6).)</p> <p>Verify that, where the initial determination and initial monitoring shows the possibility of any employee exposure at or above the action level, the employer conducts monitoring which is representative of the exposure for each employee in the work-place who is exposed to lead.</p> <p>(NOTE: Where the employer has previously monitored for lead exposure, and the data were obtained within the past 12 mo during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy this representative monitoring requirements if the sampling and analytical methods have an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 µg/m<sup>3</sup>.)</p>
<p><b>CL.20.9.</b> A written record must be made of any negative initial determination (29 CFR 1926.62(d)(5)).</p>	<p>Verify that, where an initial determination is made that no employee is exposed to airborne concentrations of lead at or above the action level, the employer makes a written record of such determination.</p> <p>Verify that this record includes at least the following information:</p> <ul style="list-style-type: none"> <li>- employee exposure monitoring results</li> <li>- any information, observations, or calculations which would indicate employee exposure to lead</li> <li>- any previous measurements of airborne lead</li> <li>- any employee complaints of symptoms which may be attributable to exposure to lead</li> <li>- the date of determination</li> <li>- location within the worksite</li> <li>- the name and social security number of each employee monitored.</li> </ul>
<p><b>CL.20.10.</b> Exposure monitoring must be performed at certain frequencies (29 CFR 1926.62(d)(6)).</p>	<p>(NOTE: If the initial determination reveals employee exposure to be below the action level, further exposure determination need not be repeated unless a change occurs which merits additional exposure assessments.)</p> <p>Verify that, if the initial determination or subsequent determination reveals employee exposure to be at or above the action level but at or below the OEL, the employer performs monitoring at least every 6 mo.</p>

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<p><b>CL.20.11.</b> Additional exposure assessments must be performed under certain circumstances (29 CFR 1926.62(d)(7)).</p> <p><b>CL.20.12.</b> Employees must be notified of their exposure (29 CFR 1926.62(d)(8)).</p> <p><b>CL.20.13.</b> The monitoring method must have a certain accuracy and confidence level (29 CFR 1926.62(d)(9)).</p>	<p>Verify that the employer continues monitoring at this required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee unless a change occurs which merits additional exposure assessments.</p> <p>Verify that, if the initial determination reveals that employee exposure is above the OEL, the employer performs monitoring quarterly.</p> <p>Verify that the employer continues monitoring at this required frequency until at least two consecutive measurements, taken at least 7 days apart, are at or below the OEL.</p> <p>Verify that, after at least two consecutive measurements (taken at least 7 days apart) are at or below the OEL but at or above the action level, the employer repeats monitoring for that employee at least every 6 mo, unless a change occurs which merits additional exposure assessments.</p> <p>Verify that the employer continues monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee unless a change occurs which merits additional exposure assessments.</p> <p>Verify that the employer conducts additional monitoring whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that either:</p> <ul style="list-style-type: none"> <li>- may result in additional employees being exposed to lead at or above the action level or</li> <li>- may result in employees already exposed at or above the action level being exposed above the OEL.</li> </ul> <p>Verify that, within 5 working days after completion of the exposure assessment, the employer notifies each employee in writing of the results which represent that employee's exposure.</p> <p>Verify that, whenever the results indicate that the representative employee exposure, (without regard to respirators) is at or above the OEL, the employer includes in the written notice a statement that the employees exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.</p> <p>Verify that the employer uses a method of monitoring and analysis which has an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 <math>\mu\text{g}/\text{m}^3</math>.</p>



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<p><b>CL.30</b>  <b>METHODS OF COMPLIANCE</b></p> <p><b>CL.30.1.</b> The employer must implement engineering and work practice controls to reduce and maintain employee exposure to lead (29 CFR 1926.62(e)(1)).</p> <p><b>CL.30.2.</b> Employers must establish and implement a written compliance program (29 CFR 1926.62(e)(2)).</p>	<p>Verify that the employer implements engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead to or below the OEL, to the extent that such controls are feasible.</p> <p>Verify that, wherever all feasible engineering and work practices controls that can be instituted are not sufficient to reduce employee exposure to or below the OEL, the employer:</p> <ul style="list-style-type: none"> <li>- uses them to reduce employee exposure to the lowest feasible level</li> <li>- supplements them by the use of respiratory protection.</li> </ul> <p>Verify that, prior to commencement of the job, each employer establishes and implement a written compliance program to reduce lead exposure levels to or below the OEL.</p> <p>Verify that written plans for these compliance programs include at least the following:</p> <ul style="list-style-type: none"> <li>- a description of each activity in which lead is emitted (e.g. equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices)</li> <li>- a description of the specific means that will be employed to achieve compliance and, where engineering controls are required engineering plans and studies used to determine methods selected for controlling exposure to lead</li> <li>- a report of the technology considered in meeting the OEL</li> <li>- air monitoring data which documents the source of lead emissions</li> <li>- a detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.</li> <li>- a work practice program which includes items required under 29 CFR 1926.62(g), (h) and (i) and incorporates other relevant work practices such as those specified in 29 CFR 1926.62(e)(5)</li> <li>- an administrative control schedule required by 29 CFR 1926.62(e)(4) if applicable</li> <li>- a description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and with respect to responsibility for compliance with this chapter as set-forth in 1926.16</li> <li>- other relevant information.</li> </ul>

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<p><b>CL.30.3.</b> Mechanical ventilation effectiveness must be evaluated (29 CFR 1926.62(e)(3)).</p> <p><b>CL.30.4.</b> Job rotation schedules must contain certain information (29 CFR 1926.62(e)(4)).</p> <p><b>CL.30.5.</b> The employer must ensure that employees follow good work practices (29 CFR 1926.62(e)(5)).</p>	<p>Verify that the compliance program provides for frequent and regular inspections of job sites, materials, and equipment to be made by a competent person.</p> <p>Verify that written programs:</p> <ul style="list-style-type: none"> <li>- are submitted upon request to any affected employee or authorized employee representatives, to the Assistant Secretary and the Director</li> <li>- are available at the worksite for examination and copying by the Assistant Secretary and the Director.</li> </ul> <p>Verify that written programs are revised and updated at least every 6 months to reflect the current status of the program.</p> <p>Verify that, when mechanical ventilation is used to control lead exposure, the employer evaluates the mechanical performance of the system in controlling exposure as necessary to maintain its effectiveness.</p> <p>Verify that, if administrative controls are used as a means of reducing employees TWA exposure to lead, the employer establishes and implements a job rotation schedule which includes:</p> <ul style="list-style-type: none"> <li>- name or identification number of each affected employee</li> <li>- duration and exposure levels at each job or work station where each affected employee is located</li> <li>- any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead.</li> </ul> <p>Verify that the employer ensures that, to the extent relevant, employees follow good work practices such as described in Appendix B of 29 CFR 1926.</p>

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<p><b>CL.40 RESPIRATORY PROTECTION</b></p> <p><b>CL.40.1.</b> Respirators must be provided and used in certain circumstances (29 CFR 1926.62(f)(1)).</p> <p><b>CL.40.2.</b> Respirators must be selected according to certain requirements (29 CFR 1926.62(f)(2)).</p> <p><b>CL.40.3.</b> Respirator usage must comply with certain requirement (29 CFR 1926.62(f)(3)).</p>	<p>Verify that, where the use of respirators is required, the employer provides (at no cost to the employee) and ensures the use of respirators.</p> <p>Respirators shall be used in the following circumstances:</p> <ul style="list-style-type: none"> <li>- whenever an employee's exposure to lead exceeds the OEL</li> <li>- in work situations in which engineering controls and work practices are not sufficient to reduce exposures to or below the OEL</li> <li>- whenever an employee requests a respirator</li> <li>- an interim protection for employees performing tasks during exposure assessments.</li> </ul> <p>Verify that, where respirators are used as protection from lead exposure, the employer selects the appropriate respirator or combination of respirators from Appendix 37-1.</p> <p>Verify that the employer provides a powered, air-purifying respirator in lieu of the respirator specified in Appendix 37-1 whenever:</p> <ul style="list-style-type: none"> <li>- an employee chooses to use this type of respirator</li> <li>- this respirator will provide adequate protection to the employee.</li> </ul> <p>Verify that the employer selects respirators from among those approved for protection against lead dust, fume, and mist by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH).</p> <p>Verify that the employer ensures that the respirator issued to the employee exhibits minimum facepiece leakage and that the respirator is fitted properly.</p> <p>Verify that employers perform either quantitative or qualitative face fit tests at the time of initial fitting and at least every six months thereafter for each employee wearing negative pressure respirators.</p> <p>(NOTE: The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn.)</p> <p>Verify that qualitative fit tests are conducted in accordance with Appendix D of 29 CFR 1926.</p>

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<p><b>CL.40.4.</b> The employer must institute a respirator program that complies with certain requirements (29 CFR 1926.62(f)(4)).</p>	<p>Verify that the tests are used to select facepieces that provide the required protection as prescribed in Appendix 37-1.</p> <p>Verify that, if an employee exhibits difficulty in breathing during the fitting test or during use, the employer makes available to the employee a medical examination.</p> <p>Verify that the employer institutes a respiratory protection program in accordance with 29 CFR 1910.134 (b), (d), (e) and (f) (see checklist items PE.30.4, PE.30.5, PE.30.7, PE.30.9, PE.40.2, PE.70.2, PE.80.1, PE.100.3, PE.100.5, PE.60.1 through 60.3, PE.60.7, PE.70.1, PE.70.4 through 70.7, PE.90.2, PE.100.2, PE.120.3).</p> <p>Verify that the employer:</p> <ul style="list-style-type: none"> <li>- permits each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected</li> <li>- maintains an adequate supply of filter elements for this purpose.</li> </ul> <p>Verify that employees who wear respirators are permitted to leave work areas to wash their face and respirator facepiece whenever necessary to prevent skin irritation associated with respirator use.</p>

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<p><b>CL.50</b>  <b>PROTECTIVE WORK CLOTHING AND EQUIPMENT</b></p> <p><b>CL.50.1.</b> Protective work clothing and equipment must be provided and used in certain circumstances (29 CFR 1926.62(g)(1)).</p> <p><b>CL.50.2.</b> The cleaning and replacement of protective work clothing and equipment must be done in accordance with certain requirements (29 CFR 1926.62(g)(2)).</p>	<p>Determine whether:</p> <ul style="list-style-type: none"> <li>- an employee is exposed to lead above the OEL, without regard to the use of respirators</li> <li>- employees are exposed to lead compounds which may cause skin or eye irritation (e.g., lead arsenate, lead azide)</li> <li>- as interim protection for employees performing tasks during exposure assessment.</li> </ul> <p>Verify that, in such circumstances, the employer provides (at no cost to the employee) appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments such as, but not limited to:</p> <ul style="list-style-type: none"> <li>- coveralls or similar full-body work clothing</li> <li>- gloves, hats, and shoes or disposable shoe coverlets</li> <li>- face shields, vented goggles, or other appropriate protective equipment which complies with 29 CFR 1910.133 (see the checklist items in PE.20).</li> </ul> <p>Verify that the employer ensures that the employee uses such appropriate protective work clothing and equipment.</p> <p>Verify that the employer provides the required protective clothing in a clean and dry condition:</p> <ul style="list-style-type: none"> <li>- at least weekly</li> <li>- daily to employees whose exposure levels without regard to a respirator are over 200 <math>\mu\text{g}/\text{m}^3</math> of lead as an 8-h TWA.</li> </ul> <p>Verify that the employer provides for the cleaning, laundering, and disposal of required protective clothing and equipment.</p> <p>Verify that the employer repairs or replaces required protective clothing and equipment as needed to maintain their effectiveness.</p> <p>Verify that the employer ensures that all protective clothing is removed at the completion of a work shift only in change areas provided for that purpose.</p>

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	<p>Verify that the employer ensures that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area which prevents dispersion of lead outside the container.</p> <p>Verify that the employer informs in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.</p> <p>Verify that the employer ensures that the containers of contaminated protective clothing and equipment are labelled as follows:</p> <p style="padding-left: 40px;">Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead-contaminated wash water in accordance with applicable local, state, or Federal regulations.</p> <p>Verify that the removal of lead from protective clothing or equipment by blowing, shaking, or any other means which disperses lead into the air does not occur.</p>

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<p><b>CL.60</b>  <b>HOUSEKEEPING</b></p> <p><b>CL.60.1.</b> All surfaces must be maintained as free as practicable of accumulations of lead (29 CFR 1926.62(h)(1)).</p> <p><b>CL.60.2.</b> Floors and other surfaces must be cleaned by methods that minimize the likelihood of lead becoming airborne (29 CFR 1926.62(h)(2) through (5)).</p>	<p>Verify that all surfaces are maintained as free as practicable of accumulations of lead.</p> <p>Verify that floors and other surfaces where lead accumulates are, wherever possible, cleaned by vacuuming or other methods that minimize the likelihood of lead becoming airborne.</p> <p>(NOTE: Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.)</p> <p>Verify that, where vacuuming methods are selected, the vacuums are equipped with HEPA filters and used and emptied in a manner which minimizes the reentry of lead into the workplace.</p> <p>Verify that compressed air is not used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.</p>



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<p><b>CL.70</b>  <b>HYGIENE FACILITIES AND PRACTICES</b></p> <p><b>CL.70.1.</b> Employers must prohibit specific activities in areas where employees are exposed to lead above the OEL (29 CFR 1926.62(i)(1)).</p> <p><b>CL.70.2.</b> Change areas must be provided for certain employees (29 CFR 1926.62(i)(2)).</p> <p><b>CL.70.3.</b> Employers must provide shower facilities for use by employees whose airborne exposure to lead is above the OEL (29 CFR 1926.62(i)(3)).</p> <p><b>CL.70.4.</b> Employers must provide lunchroom facilities or eating areas for employees whose airborne exposure to lead is above the OEL (29 CFR 1926.62(i)(4)(i) and (ii)).</p>	<p>Verify that the employer ensures that, in areas where employees are exposed to lead above the OEL without regard to the use of respirators:</p> <ul style="list-style-type: none"> <li>- food or beverage is not present or consumed</li> <li>- tobacco products are not present or used</li> <li>- cosmetics are not applied.</li> </ul> <p>Verify that the employer provides clean change areas for employees whose airborne exposure to lead is above the OEL, and as interim protection for employees performing tasks during exposure assessment, without regard to the use of respirators.</p> <p>Verify that the employer ensures that change areas are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.</p> <p>Verify that the employer ensures that employees do not leave the workplace wearing any protective clothing or equipment that is required to be worn during the work shift.</p> <p>Verify that the employer provides shower facilities, where feasible, for use by employees whose airborne exposure to lead is above the OEL.</p> <p>Verify that the employer:</p> <ul style="list-style-type: none"> <li>- ensures, where shower facilities are available, that employees shower at the end of the work shift</li> <li>- provides an adequate supply of cleansing agents and towels for use by affected employees.</li> </ul> <p>Verify that the employer provides lunchroom facilities or eating areas for employees whose airborne exposure to lead is above the OEL, without regard to the use of respirators.</p> <p>Verify that the employer ensures that lunchroom facilities or eating areas are as free as practicable from lead contamination and are readily accessible to employees.</p>

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<p><b>CL.70.5.</b> Employees whose airborne exposure to lead is above the OEL must wash their hands and face prior to engaging in certain activities (29 CFR 1926.62(i)(4)(iii)).</p>	<p>Verify that the employer ensures that employees whose airborne exposure to lead is above the OEL, without regard to the use of a respirator, wash their hands and face prior to eating, drinking, smoking or applying cosmetics.</p>
<p><b>CL.70.6.</b> Employees must not enter lunchroom facilities with protective clothing or equipment (29 CFR 1926.62(i)(4)(iv)).</p>	<p>Verify that the employer ensures that employees do not enter lunchroom facilities or eating areas with protective work clothing or equipment.</p> <p>(NOTE: This requirement does not apply if surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method that limits dispersion of lead dust.)</p>
<p><b>CL.70.7.</b> The employer must provide adequate handwashing facilities for use by employees exposed to lead (29 CFR 1926.62(i)(5) and 29 CFR 1926.51(f)).</p>	<p>Verify that the employer provides adequate handwashing facilities for use by employees exposed to lead.</p> <p>Verify that the lavatories are maintained in a sanitary condition.</p> <p>Verify that the installation provides each lavatory with:</p> <ul style="list-style-type: none"> <li>- hot and cold running water, or tepid running water</li> <li>- hand soap or similar cleansing agents.</li> </ul> <p>Verify that the installation supplies any of the following in a location convenient to the lavatories:</p> <ul style="list-style-type: none"> <li>- individual hand towels, or sections thereof, of cloth or paper</li> <li>- warm air blowers</li> <li>- clean individual sections of continuous clothing toweling.</li> </ul> <p>Verify that, where showers are not provided, the employer ensures that employees wash their hands and face at the end of the workshift.</p>

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<p><b>CL.80</b>  <b>MEDICAL SURVEILLANCE</b></p> <p><b>CL.80.1.</b> Employers must institute a medical surveillance program for certain employees (29 CFR 1926.62(j)(1)).</p> <p><b>CL.80.2.</b> Blood lead and ZPP level sampling and analysis must be performed according to a specific schedule (29 CFR 1926.62(j)(2)(i)).</p> <p><b>CL.80.3.</b> Follow-up blood sampling tests must be performed in certain situations (29 CFR 1926.62(j)(2)(ii)).</p>	<p>Verify that the employer makes available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level.</p> <p>(NOTE: Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.)</p> <p>Verify that the employer institutes a medical surveillance program for all employees who are or may be exposed by the employer at or above the action level for more than 30 days in any consecutive 12 mo.</p> <p>Verify that the employer ensures that all medical examinations and procedures are performed by or under the supervision of a licensed physician.</p> <p>Verify that the employer makes available the required medical surveillance including multiple physician review without cost to employees and at a reasonable time and place.</p> <p>Verify that the employer makes available biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels to each affected employee according to the following schedule:</p> <ul style="list-style-type: none"> <li>- at least every 2 mo for the first 6 mo and every 6 mo thereafter -- for each employee who was exposed by the employer at or above the action level for more than 30 days in any consecutive 12 mo</li> <li>- at least every 2 mo -- for each employee whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/dl and either: <ul style="list-style-type: none"> <li>- was occupationally exposed on any day to lead at or above the action level</li> <li>- was exposed by the employer at or above the action level for more than 30 days in any consecutive 12 mo</li> </ul> <p>(NOTE: This frequency is to continue until two consecutive blood samples and analyses indicate a blood lead level below 40 µg/dl)</p> </li> <li>- at least monthly during the removal period -- for each employee who is removed from exposure to lead due to an elevated blood lead level.</li> </ul> <p>Verify that, whenever the results of a blood lead level test indicate that an employee's blood lead level exceeds 50 µg/dl, the employer provides a second (follow-up) blood sampling test within two weeks after the employer receives the results of the first blood sampling test.</p>

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<b>CL.80.4.</b> Blood lead level sampling and analysis must be accurate and be conducted by an approved laboratory (29 CFR 1926.62(j)(2)(iii)).	<p>Verify that blood lead level sampling and analysis:</p> <ul style="list-style-type: none"> <li>- has an accuracy (to a confidence level of 95 percent) within plus or minus 15 percent or 6 µg/dl, whichever is greater</li> <li>- is conducted by a laboratory approved by OSHA.</li> </ul>
<b>CL.80.5.</b> Employees must be notified of certain information (29 CFR 1926.62(j)(2)(iv)).	<p>Verify that, within five working days after the receipt of biological monitoring results, the employer notifies each employee in writing of his or her blood lead level.</p> <p>Verify that the employer notifies each employee whose blood lead level exceeds 40 µg/dl that temporary medical removal with Medical Removal Protection benefits is required when an employee's blood lead level exceeds 50 µg/dl.</p>
<b>CL.80.6.</b> Employers must make medical examinations and consultations available to certain employees (29 CFR 1926.62(j)(3)(i) through (iii) and (j)(3)(vi)).	<p>Verify that the employer makes available medical examinations and consultations to each employee who is or may be exposed by the employer at or above the action level for more than 30 days in any consecutive 12 mo on the following schedule:</p> <ul style="list-style-type: none"> <li>- at least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 mo indicated a blood lead level at or above 40 µg/dl</li> <li>- as soon as possible, upon notification by an employee either that: <ul style="list-style-type: none"> <li>- the employee has developed signs or symptoms commonly associated with lead intoxication</li> <li>- that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child</li> <li>- that the employee is pregnant</li> <li>- that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use</li> </ul> </li> <li>- as medically appropriate for each employee either removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited pursuant to a final medical determination.</li> </ul> <p>Verify that the content of these medical examinations is determined by an examining physician and, if requested by an employee, includes pregnancy testing or laboratory evaluation of male fertility.</p> <p>(NOTE: This requirement does not apply to the annual examination.)</p> <p>Verify that annual medical examinations include the following elements:</p> <ul style="list-style-type: none"> <li>- a detailed work history and a medical history, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive and neurological problems</li> </ul>

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	<ul style="list-style-type: none"> <li>- a thorough physical examination, with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems (NOTE: Pulmonary status should be evaluated if respiratory protection will be used)</li> <li>- a blood pressure measurement</li> <li>- a blood sample and analysis which determines:               <ul style="list-style-type: none"> <li>- blood lead level</li> <li>- hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology</li> <li>- zinc protoporphyrin</li> <li>- blood urea nitrogen</li> <li>- serum creatinine</li> </ul> </li> <li>- a routine urinalysis with microscopic examination</li> <li>- any laboratory or other test relevant to lead exposure which the examining physician deems necessary by sound medical practice.</li> </ul> <p>(NOTE: If the employer selects the initial physician who conducts any medical examination or consultation provided to an employee, the employee may designate a second physician:</p> <ul style="list-style-type: none"> <li>- to review any findings, determinations, or recommendations of the initial physician</li> <li>- to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.)</li> </ul> <p>Verify that the employer promptly notifies an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation under this checklist item.</p> <p>(NOTE: The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within 15 days after receipt of the foregoing notification, or receipt of the initial physician's written opinion, whichever is later:</p> <ul style="list-style-type: none"> <li>- the employee informing the employer that he or she intends to seek a second medical opinion</li> <li>- the employee initiating steps to make an appointment with a second physician.)</li> </ul> <p>Verify that, if the findings, determinations, or recommendations of the second physician differ from those of the initial physician, the employer and the employee ensure that efforts are made for the two physicians to resolve any disagreement.</p> <p>Verify that, if the two physicians have been unable to quickly resolve their disagreement, the employer and the employee through their respective physicians designate a third physician:</p>

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<p><b>CL.80.7.</b> Employers must provide certain information to the examining and consulting physicians (29 CFR 1926.62(j)(3)(iv)).</p> <p><b>CL.80.8.</b> Employers must obtain from the examining physician a written opinion that meets certain requirements (29 CFR 1926.62(j)(3)(v)).</p>	<ul style="list-style-type: none"> <li>- to review any findings, determinations, or recommendations of the prior physicians</li> <li>- to conduct such examinations, consultations, laboratory tests, and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.</li> </ul> <p>Verify that the employer acts consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.</p> <p>(NOTE: The employer and an employee or authorized employee representative may agree upon the use of any alternate physician determination mechanism in lieu of the multiple physician review mechanism so long as the alternate mechanism is as expeditious and protective as the requirements contained in 29 CFR 1926.62(j) (see this checklist item, CL.80.7, and CL.80.8.)</p> <p>Verify that the employer provides an initial physician conducting a medical examination or consultation with the following information:</p> <ul style="list-style-type: none"> <li>- a copy of 29 CFR 1926.62 including all appendices</li> <li>- a description of the affected employee's duties as they relate to the employee's exposure</li> <li>- the employee's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable)</li> <li>- a description of any personal protective equipment used or to be used</li> <li>- prior blood lead determinations</li> <li>- all prior written medical opinions concerning the employee in the employer's possession or control.</li> </ul> <p>Verify that the employer provides the foregoing information to a second or third physician conducting a medical examination or consultation upon request either by the second or third physician, or by the employee.</p> <p>Verify that the employer obtains and furnishes the employee with a copy of a written medical opinion from each examining or consulting physician which contains only the following information:</p> <ul style="list-style-type: none"> <li>- the physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead</li> <li>- any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead</li> </ul>

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<p><b>CL.80.9.</b> Chelation must comply with certain requirements (29 CFR 1926.62(j)(4)).</p>	<ul style="list-style-type: none"> <li>- any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator</li> <li>- the results of the blood lead determinations.</li> </ul> <p>Verify that the employer instructs each examining and consulting physician to:</p> <ul style="list-style-type: none"> <li>- not reveal either in the written opinion or orally, or in any other means of communication with the employer, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead</li> <li>- advise the employee of any medical condition, occupational or nonoccupational, which dictates further medical examination or treatment.</li> </ul> <p>Verify that the employer ensures that any person whom he retains, employs, supervises or controls does not engage in prophylactic chelation of any employee at any time.</p> <p>Verify that, if therapeutic or diagnostic chelation is to be performed, the employer ensures that it be done under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring and that the employee is notified in writing prior to its occurrence.</p>



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<p><b>CL.90</b>  <b>MEDICAL REMOVAL PROTECTION</b></p> <p><b>CL.90.1.</b> Employees must be temporarily removed from work having exposure to lead in certain circumstances (29 CFR 1926.62(k)(1)(i) and (ii)).</p> <p><b>CL.90.2.</b> The return of the employee to his or her former job status must comply with certain requirements (29 CFR 1926.62(k)(1)(iii) through (v)).</p>	<p>Verify that the employer removes an employee from work having an exposure to lead at or above the action level on each occasion that a periodic and a follow-up blood sampling test conducted pursuant to this chapter indicate that the employee's blood lead level is at or above 50 µg/dl.</p> <p>Verify that the employer removes an employee from work having an exposure to lead at or above the action level on each occasion that a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.</p> <p>Verify that, where a final medical determination results in any recommended special protective measures for an employee, or limitations on an employee's exposure to lead, the employer implements and acts consistent with the recommendation.</p> <p>Verify that the employer returns an employee to his or her former job status:</p> <ul style="list-style-type: none"> <li>- for an employee removed due to a blood lead level at or above 50 µg/dl, when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 40 µg/dl</li> <li>- for an employee removed due to a final medical determination, when a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.</li> </ul> <p>(NOTE: The requirement that an employer return an employee to his or her former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.)</p> <p>Verify that the employer removes any limitations placed on an employee or end any special protective measures provided to an employee pursuant to a final medical determination when a subsequent final medical determination indicates that the limitations or special protective measures are no longer necessary.</p> <p>Determine whether the multiple physician review mechanism, or alternate medical determination mechanism used pursuant to the medical surveillance provisions, has not yet resulted in a final medical determination with respect to an</p>

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<p><b>CL90.3.</b> Employers must provide medical removal protection benefits under certain circumstances (29 CFR 1926.62 (k)(2)).</p>	<p>employee.</p> <p>Verify that, in such situations, the employer acts as follows:</p> <ul style="list-style-type: none"> <li>- the employer may remove the employee from exposure to lead, provide special protective measures to the employee, or place limitations upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status</li> <li>- the employer may return the employee to his or her former job status, end any special protective measures provided to the employee, and remove any limitations placed upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status.</li> </ul> <p>(NOTE: This provision for the return of an employee to his or her former job status does not apply, and the employer must await a final medical determination, if either:</p> <ul style="list-style-type: none"> <li>- the initial removal, special protection, or limitation of the employee resulted from a final medical determination which differed from the findings, determinations, or recommendations of the initial physician</li> <li>- the employee has been on removal status for the preceding eighteen months due to an elevated blood lead level.)</li> </ul> <p>Verify that the employer provides an employee up to 18 mo of medical removal protection benefits on each occasion that an employee is removed from exposure to lead or otherwise limited.</p> <p>(NOTE: For the purposes of this chapter, the requirement that an employer provide medical removal protection benefits means that, as long as the job the employee was removed from continues, the employer must maintain the total normal earnings, seniority and other employment rights and benefits of an employee, including the employee's right to his or her former job status as though the employee had not been medically removed from the employee's job or otherwise medically limited.)</p> <p>(NOTE: During the period of time that an employee is medically removed from his or her job or otherwise medically limited, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow--up medical surveillance made available pursuant to this chapter.)</p> <p>Verify that, if a removed employee files a claim for workers' compensation payments for a lead-related disability, the employer continues to provide medical removal protection benefits pending disposition of the claim.</p>

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	<p>(NOTE: To the extent that an award is made to the employee for earnings lost during the period of removal, the employer's medical removal protection obligation must be reduced by such amount. The employer must receive no credit for workers' compensation payments received by the employee for treatment-related expenses.)</p> <p>(NOTE: The employer's obligation to provide medical removal protection benefits to a removed employee must be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or receives income from employment with another employer made possible by virtue of the employee's removal.)</p> <p>Verify that, where an employer (although not required by this chapter to do so) removes an employee from exposure to lead or otherwise places limitations on an employee due to the effects of lead exposure on the employee's medical condition, the employer provides medical removal protection benefits to the employee equal to that required by this checklist item.</p>



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<p><b>CL.100 EMPLOYEE INFORMATION AND TRAINING</b></p> <p><b>CL.100.1.</b> Employers must communicate specific hazard information in accordance with 29 CFR 1926.59 (29 CFR 1926.62(l)(1)(i)).</p> <p><b>CL.100.2.</b> Employers must provide a training program for certain personnel (29 CFR 1926.62(l)(1)(ii) through (iv)).</p> <p><b>CL.100.3.</b> Employers must provide specific information as part of the training program (29 CFR 1926.62(l)(2)).</p>	<p>Verify that the employer communicates information concerning lead hazards according to the requirements of OSHA's Hazard Communication Standard for the construction industry, 29 CFR 1926.59, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and employee information and training.</p> <p>Verify that the employer provides a training program for all employees who are subject to either:</p> <ul style="list-style-type: none"> <li>- exposure to lead at or above the action level on any day</li> <li>- exposure to lead compounds which may cause skin or eye irritation (e.g., lead arsenate, lead azide).</li> </ul> <p>Verify that the employer ensures employee participation in the training program.</p> <p>Verify that the employer provides the training program:</p> <ul style="list-style-type: none"> <li>- as initial training prior to the time of job assignment</li> <li>- at least annually for each employee who is subject to lead exposure at or above the action level on any day.</li> </ul> <p>Verify that the employer ensures that each employee is trained in the following:</p> <ul style="list-style-type: none"> <li>- the contents of 29 CFR 1926.62 and its appendices</li> <li>- the specific nature of the operations which could result in exposure to lead above the action level</li> <li>- the purpose, proper selection, fitting, use, and limitations of respirators</li> <li>- the purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant)</li> <li>- the engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of 29 CFR 1926.62</li> <li>- the contents of any compliance plan in effect</li> <li>- instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician</li> </ul>

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<b>CL.100.4.</b> Employees must make information and training materials accessible to employees (29 CFR 1926.62(l)(3)).	<p>- the employee's right of access to records under 29 CFR 1910.1020.</p> <p>Verify that the employer makes readily available to all affected employees a copy of 29 CFR 1926.62 and its appendices.</p> <p>Verify that the employer provides, upon request, all materials relating to the employee information and training program to affected employees and their designated representatives, and to the Assistant Secretary and the Director.</p>

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<p><b>CL.110</b> <b>SIGNS</b></p> <p><b>CL.110.1.</b> Employers must post warning signs in work areas where the OEL is exceeded (29 CFR 1926.62(m)).</p>	<p>(NOTE: The employer may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this checklist item.)</p> <p>Verify that the employer ensures that no statement appears on or near any required sign which contradicts or detracts from the meaning of the required sign.</p> <p>Verify that the employer posts the following warning signs in each work area where an employees exposure to lead is above the OEL:</p> <p style="text-align: center;">WARNING LEAD WORK AREA POISON NO SMOKING OR EATING</p> <p>Verify that the employer ensures that required signs are illuminated and cleaned as necessary so that the legend is readily visible.</p>



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<p><b>CL.120</b>  <b>RECORDKEEPING</b></p> <p><b>CL.120.1.</b> Exposure assessment records must be maintained in accordance with certain requirements (29 CFR 1926.62(n)(1)).</p> <p><b>CL.120.2.</b> Medical surveillance records must be maintained in accordance with certain requirements (29 CFR 1926.62(n)(2)).</p>	<p>Verify that the employer establishes and maintains an accurate record of all monitoring and other data used in conducting employee exposure assessments as required in 29 CFR 1926.62(d) (see the checklist items in CL.20).</p> <p>Verify that exposure monitoring records include:</p> <ul style="list-style-type: none"> <li>- the date(s), number, duration, location and results of each of the samples taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable</li> <li>- a description of the sampling and analytical methods used and evidence of their accuracy</li> <li>- the type of respiratory protective devices worn, if any</li> <li>- name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent</li> <li>- the environmental variables that could affect the measurement of employee exposure.</li> </ul> <p>Verify that the employer maintains monitoring and other exposure assessment records in accordance with the additional requirements of 29 CFR 1910.1020 (see the checklist items in RK.60).</p> <p>Verify that the employer establishes and maintains an accurate record for each employee subject to required medical surveillance.</p> <p>Verify that this record includes:</p> <ul style="list-style-type: none"> <li>- the name, social security number, and description of the duties of the employee</li> <li>- a copy of the physician's written opinions</li> <li>- results of any airborne exposure monitoring done on or for that employee and provided to the physician</li> <li>- any employee medical complaints related to exposure to lead.</li> </ul> <p>Verify that the employer keeps, or ensures that the examining physician keeps, the following medical records:</p> <ul style="list-style-type: none"> <li>- a copy of the results from the required medical examination including medical and work history</li> <li>- a description of the laboratory procedures and a copy of any standards or guide-lines used to interpret the test results or references to that information</li> <li>- a copy of the results of biological monitoring.</li> </ul>

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<p><b>CL.120.3.</b> Employers must establish and maintain accurate records for employees medically removed from exposure to lead (29 CFR 1926.62(n)(3)).</p> <p><b>CL.120.4.</b> Employers must retain records of objective data for exemption from requirement for initial monitoring for at least 30 yr (29 CFR 1926.62(n)(4)).</p> <p><b>CL.120.5.</b> Employers must make available certain records (29 CFR 1926.62(n)(5)).</p> <p><b>CL.120.6.</b> Transfer of records must meet specific requirements (29 CFR 1926.62(n)(6)).</p>	<p>Verify that the employer maintains or ensures that the physician maintains medical records in accordance with the additional requirements of 29 CFR 1910.1020.</p> <p>Verify that the employer establishes and maintains an accurate record for each employee removed from current exposure to lead.</p> <p>Verify that each record includes:</p> <ul style="list-style-type: none"> <li>- the name and social security number of the employee</li> <li>- the date of each occasion that the employee was removed from current exposure to lead as well as the corresponding date on which the employee was returned to his or her former job status</li> <li>- a brief explanation of how each removal was or is being accomplished</li> <li>- a statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.</li> </ul> <p>Verify that the employer maintains each medical removal record for at least the duration of an employee's employment.</p> <p>Verify that the employer maintains the record of the objective data (see definitions) relied upon for at least 30 yr.</p> <p>Verify that the employer makes available upon request all of the following records to affected employees, former employees, and their designated representatives, and to the Assistant Secretary and the Director for examination and copying:</p> <ul style="list-style-type: none"> <li>- exposure monitoring records</li> <li>- medical surveillance records</li> <li>- medical removal records</li> <li>- records of objective data for exemption from requirements for initial monitoring.</li> </ul> <p>Verify that, in the event of personnel reassignment, the following records accompany affected personnel and are retained by the new installation:</p> <ul style="list-style-type: none"> <li>- exposure monitoring records</li> <li>- medical surveillance records</li> <li>- medical removal records</li> <li>- records of objective data for exemption from requirements for initial monitoring.</li> </ul>

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	<p>Verify that, in the event of installation closure, all records required by this chapter are retired in accordance with the tables in AFI 37-138.</p> <p>(NOTE: The AFI requires that case files be forwarded intact to the records retention center under the direction of the National Records Center.)</p> <p>Verify that the installation meets any additional requirements concerning records transfer in 29 CFR 1910.1020(h), except that no records are to be transferred to the Director of NIOSH.</p>



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<p><b>CL.130</b>  <b>OBSERVATION OF MONITORING</b></p> <p><b>CL.120.1.</b> Employers must allow affected employees or their designated representatives an opportunity to observe monitoring of employee exposure (29 CFR 1926.62(o)(1)).</p> <p><b>CL.120.2.</b> Observers of employee exposure monitoring must be adequately protected and follow specific procedures (29 CFR 1926.62(o)(2)).</p>	<p>Verify that the employer provides affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead conducted under the provisions for exposure assessment.</p> <p>Verify that, whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing or equipment is required, the employer:</p> <ul style="list-style-type: none"> <li>- provides the observer with and ensures the use of such respirators, clothing and equipment</li> <li>- requires the observer to comply with all other applicable safety and health procedures.</li> </ul> <p>(NOTE: Without interfering with the monitoring, observers are entitled to:</p> <ul style="list-style-type: none"> <li>- receive an explanation of the measurement procedures</li> <li>- observe all steps related to the monitoring of lead performed at the place of exposure</li> <li>- record the results obtained or receive copies of the results when returned by the laboratory.</li> </ul>



## Appendix 37-1

### Respiratory Protection for Lead Aerosols (29 CFR 1926.62, Table I)

Airborne concentration of lead or condition of use	Required respirator <sup>1</sup>
Not in excess of 500 $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>- Half-mask air purifying respirator with high efficiency filters <sup>2,3</sup></li> <li>- Half-mask supplied air respirator operated in demand (negative pressure) mode.</li> </ul>
Not in excess of 1250 $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>- Half-mask air purifying respirator with high efficiency filters <sup>2,3</sup></li> <li>- Half-mask supplied air respirator operated in demand (negative pressure) mode.</li> </ul>
Not in excess of 2500 $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>- Full facepiece air purifying respirator with high efficiency filters <sup>3</sup></li> <li>- Tight fitting powered air purifying respirator with high efficiency filters <sup>3</sup></li> <li>- Full facepiece supplied air respirator operated in demand mode.</li> <li>- Half-mask or full facepiece supplied air respirator operated in a continuous-flow mode.</li> <li>- Full facepiece self-contained breathing apparatus (SCBA) operated in demand mode.</li> </ul>
Not in excess of 50,000 $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>- Half-mask supplied air respirator operated in pressure demand or other positive-pressure mode.</li> </ul>
Not in excess of 100,000 $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>- Full facepiece supplied air respirator operated in pressure demand or other positive-pressure mode (e.g., type CE abrasive blasting respirators operated in a positive-pressure mode).</li> </ul>
Greater than 100,000 $\mu\text{g}/\text{m}^3$ , unknown concentration, or fire fighting	<ul style="list-style-type: none"> <li>- Full facepiece SCBA operated in pressure demand or other positive-pressure mode.</li> </ul>

<sup>1</sup> Respirators specified for higher concentrations can be used at lower concentrations of lead.

<sup>2</sup> Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

<sup>3</sup> A high efficiency particulate filter (HEPA) means a filter that is a 99.97 percent efficient against particles of 0.3 micron size or larger.



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**Part II:**

**Safety**

## FOREWORD

This is USACERL Special Report 95/36, Vol. 2, revised September 1997. The report is up-to-date through 62 *Federal Register*, No. 125, dated 30 June 1997.

The research was performed for the Air National Guard Readiness Center (ANGRC), under Military Interdepartmental Purchase Request (MIPR) number 97-30-20, dated 26 November 1996. The ANGRG technical monitor was Mr. Chuck Smith, ANGRG/CEVC.

The research was performed by the Planning and Management Laboratory, Environmental Processes Division (PL-N), of the U.S. Army Construction Engineering Research Laboratories (USACERL). The Principal Investigator was Dr. David A. Krooks, PL-N. L. Jerome Benson is Acting Division Chief, PL-N. L. Michael Golish is Operations Chief, PL.

COL James A. Walter is Commander, and Dr. Michael J. O'Connor is Director of USACERL.



## PART TWO: SAFETY

### ECAMP - ANG

September 1997

#### A. Applicability of This Protocol

This section includes Federal regulations and the responsibilities and requirements derived from them that have to do with safety issues at Air National Guard (ANG) installations. The topics addressed include: walking and working surfaces, means of egress, powered platforms, certain hazardous materials, personal protective equipment (PPE), permit-required confined spaces, lockout/tagout, and certain fire protection issues. Also included are requirements for materials handling and storage, machinery and machine guarding, hand held equipment, welding and related issues, and some safety-related work practices (electrical).

The wide range of Federally regulated topics covered here may raise issues with regard to equipment some of which is likely to be in use on almost every ANG installation. As a result, it can be expected that one or more portions of this section of the manual will apply to every ANG installation.

None of the requirements in this section apply to state employees working on an ANG facility. It is the sole responsibility of the individual state to provide occupational health support for its workers. No ANG funds shall be expended to provide medical monitoring, industrial hygiene, or personal protective equipment for state employees.

#### B. Federal Legislation

- 29 CFR 1910, *Occupational Safety and Health Standards*. The *Occupational Safety and Health Act* of 1970, requires employers to provide workers with a safe workplace. Regulations promulgated pursuant to this Act are compiled at 29 CFR 1910 and contain specific requirements for particular types of workplace hazards. This part of Volume 2 of the ECAMP supplement addresses 29 CFR requirements that apply in the following topic areas:
  1. Walking-Working Surfaces (1910.21 through 1910.27)
  2. Means of Egress (1910.35 through 1910.38)
  3. Hazardous Materials (Compressed Gases) (1910.101, and 1910.103 through 1910.105)
  4. Personal Protective Equipment (1910.133 and 1910.135 through 1910.138)
  5. General Environmental Controls (1910.145 through 1910.147)
  6. Medical Services and First Aid (1910.151)
  7. Fire Protection (1910.157 and 1910.158)
  8. Materials Handling and Storage (1910.176 through 1910.179)
  9. Machinery and Machine Guarding (1910.211 through 1910.213, and 1910.215)
  10. Hand and Portable Powered Tools and Other Hand-held Equipment (1910.241 through 1910.244)
  11. Welding, Cutting, and Brazing (1910.251 through 1910.255)
  12. Safety-Related Work Practices (Electrical) (1910.331 through 1910.335)
- 29 CFR 1960, *Basic Program Elements for Federal Employee OSH Programs and Related Matters*, establishes the basic program elements for all agencies of the Executive Branch. They apply to all working conditions of Federal employees except those that involve uniquely military equipment, operations, and systems. These elements include:
  1. Qualifications of Safety and Health Inspectors
  2. Conduct of Inspections
  3. Notices of Unsafe and Unhealthful Working Conditions
  4. Abatement of Unsafe and Unhealthful Working Conditions

### **C. State/Local Requirements**

- Neither state nor local requirements are included in this part of the ECAMP supplement.

### **D. Department of Defense (DOD) Regulations**

- DODI 6055.1, *DOD Occupational Safety and Health Program*, 26 October 1984, through Change 1, 11 April 1989.

### **E. U.S. Air Force Instructions (AFIs)**

A number of AFIs have been used as sources for the checklist items. They are:

- AFI 91-202, *The US Air Force Mishap Prevention Program*, 1 October 1995.
- AFI 91-204, *Safety Investigations and Reports*, 1 December 1996.
- AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program*, 1 June 1996.

### **F. Key Compliance Requirements**

The purpose of the environmental/occupational health program is to minimize the loss of AF resources and to protect AF personnel from work-related deaths, injuries, and occupational illnesses by managing risks. The proper implementation of an aggressive and comprehensive environmental/occupational health program will result in a positive return on investment and an increase in readiness. Compliance with OSHA regulations is of secondary importance to the preservation of the health and safety of AF personnel and other resources; however, these regulations do serve as a benchmark for evaluating the effectiveness of the ANG's programs. DOD, AF, and ANG directives must be complied with, and should be given appropriate weight when considering the implementation of an occupational health program or hazard abatement project. A strong environmental/occupational health program is a vital element in the continued accomplishment of the ANG's mission.

The compliance requirements in this section are many and extremely varied. The regulations are often written in such a way that they apply only in specific circumstances or to specific pieces of equipment. It is highly unlikely that any one installation will have to demonstrate compliance with all the items in any particular major section of the protocol. In broad outline, the key requirements can be summarized as follows:

- The installation's floors, wall openings, and walkways must be designed and maintained in such way that neither people nor objects fall from or through them. Stairs, ladders, and scaffolds must be soundly constructed and carefully maintained. In addition, scaffolds must be secured.
- The installation's buildings must have enough safe, marked, illuminated exits to permit the prompt escape of occupants in case of an emergency. Each installation must also have a written Emergency Action Plan and a written Fire Prevention Plan, both of which are to be reviewed with all personnel.
- The installation must ensure that powered platforms used for building maintenance are safe and are used properly by trained individuals. Those individuals who use powered platforms must wear personal fall arrest systems at all times, and the platforms must be inspected, maintained, and tested in accordance with specific schedules.
- The installation's personnel must handle, store, use, and maintain cylinders of compressed gases safely.

- PPE that is appropriate to potential hazards must be provided, used, and properly maintained.
- Installations must provide signs and tags that identify and provide information about actual or potential hazardous conditions that are out of the ordinary, unexpected, or not readily apparent. Installations must evaluate work places in order to determine whether any qualify as permit-required confined spaces. If it has such spaces, it must develop a written permit-space program and train the personnel who enter such spaces and those who function as attendants. Certain installations may also have to develop an energy control (lockout/tagout) program that prevents the release of stored energy from machines and equipment during service or maintenance.
- Installations are responsible for the appropriate placement, use, maintenance, and testing of portable fire extinguishers. If standpipe and hose systems are used, the installation must ensure that the system and all associated equipment is easily identifiable and readily acceptable. In addition, such equipment must be inspected, maintained, and stored properly.
- Installations must ensure that multipiece and single rim wheels for large vehicles are serviced properly. A safe operating procedure must be developed, and employees must be instructed in and follow the provisions of that safe operating procedure. If powered industrial trucks are in use on the installation, they must have been approved by a national testing laboratory, and those who operate them must be properly trained and authorized to use them. If overhead and/or gantry cranes are in use on the installation, they must be provided with safety devices, inspected, maintained, and operated properly; they may be operated only by designated personnel.
- The installation is responsible for the safe condition of the woodworking and abrasive machinery used by its personnel. Power tools must be equipped with proper shields, guards, attachments, and shut off devices. Power tools must be properly maintained and must not be used unless they are in good repair.
- The installation is responsible for the safe condition of the tools and equipment used by its personnel. To this end, power tools must be equipped with proper shields, guards, and attachments, and they must have shut-off devices. Such tools must not be used unless they are in good repair.
- Installations must ensure that welding, cutting, and brazing operations are performed in a safe manner by qualified personnel. The equipment used for these purposes must be properly operated and properly maintained.
- Installations must ensure that their personnel are familiar with and properly trained for duties in work areas where they might be exposed to electrical hazards.

## **G. Responsibility for Compliance**

In accordance with AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program*, the overall responsibility for compliance with the requirements contained in Part II of the second volume of the ANG supplement to the TEAM Guide rests with the Installation Commander.

The Installation Commander (employer) must provide a safe and healthful workplace for all Air Force/Air National Guard employees. The Installation Commander requires the unit commanders, tenant commanders, functional managers, and supervisors to enforce AFOSH and OSHA program requirements within their areas of responsibility.

The Installation Ground Safety Manager is responsible for managing the occupational safety program. Public Health is responsible for occupational health education and medical monitoring. The installation Fire Chief manages the fire protection program. The commanders, functional managers, and supervisors ensure compliance with occupational safety, fire prevention, and health program requirements in their areas of responsibility.

The foremost role in the safety program is played by the installation members (employees). They are required to comply with AFOSH/OSHA guidelines, and promptly report safety, fire, and health hazards in the interest of mishap prevention.

## **SAFETY**

### **Records To Review**

- Inspection records
- Maintenance records
- Training records
- Permit space program
- Emergency action plan and fire protection plan (if necessary)
- Base hazard abatement log
- Minutes of base Occupational Safety and Health Committee
- Occupational health metrics
- Environmental Differential Pay entitlements
- Log of occupational injuries and illnesses
- Minutes of the Aerospace Medicine Committee

### **Physical Features To Inspect**

- Industrial work places

### **People To Interview**

- BE (Bioenvironmental Engineering)
- PH (Public Health)
- Shop Supervisors
- SE (Base Safety)
- DEF (Fire Department)
- LGC (Logistics--Contracts)



## **SAFETY**

### **Root Causes**

The following descriptors are used in filling out finding sheets under the protocols in this part of Volume 2 of the ANG Supplement:

- **Personal Factors**
  - P1 Insufficient training
  - P2 Lack of skill or experience
  - P3 Lack of motivation
  - P4 Competing priorities
- **Organization Factors**
  - O1 Inadequate procedures
  - O2 Procedures not available
  - O3 Inadequate local guidance
  - O4 Inadequate local scheduling
  - O5 Inadequate local planning
  - O6 Inadequate guidance from higher echelons
- **Resource Factors**
  - R1 Insufficient manpower available
  - R2 Insufficient funding available
  - R3 Insufficient material available
  - R4 Insufficient sampling and monitoring equipment available
- **Equipment and Facility Factors**
  - E1 Inadequate facility design or selection
  - E2 Inadequate facility maintenance
  - E3 Inadequate equipment selection
  - E4 Inadequate equipment maintenance
  - E5 Other equipment or facility factors
- **External Factors**
  - X1 Delays due to deployment
  - X2 Delays due to change of mission
  - X3 Delays due to personnel changes
  - X4 Delays due to other external factors

## Violation Types/Related Causes

The following descriptors are used in filling out finding sheets under the protocols in this part of Volume 2 of the ANG Supplement:

- Personal Factors

- P1 Operating without authority (Other)
- P2 Operating without authority -- Permits
- P3 Operating without authority -- Certification
- P4 Operating without authority -- Training
- P5 Failure to warn (Other)
- P6 Failure to warn -- Signs
- P7 Failure to warn -- Labels or tags
- P8 Failure to secure or lock out
- P9 Operating at improper speed
- P10 Making safety devices inoperable
- P11 Using defective equipment
- P12 Using defective PPE
- P13 Using equipment improperly
- P14 Using PPE improperly
- P15 Using incorrect equipment
- P16 Using incorrect PPE
- P17 Failure to use PPE
- P18 Maintaining PPE inadequately or improperly
- P19 Storing PPE inadequately or improperly
- P20 Improper loading or placement
- P21 Taking improper position
- P22 Servicing equipment in motion
- P23 Horseplay

- Conditions (ANSI Z16.2)

- C1 Inadequate guards or protection
- C2 Defective tools
- C3 Defective equipment
- C4 Defective tools
- C5 Defective substances
- C6 Congestion
- C7 Inadequate warning, interlock system
- C8 Fire and explosion hazards
- C9 Substandard housekeeping
- C10 Inadequate illumination
- C11 Inadequate ventilation
- C12 Hazardous exposures -- gases
- C13 Hazardous exposures -- dusts
- C14 Hazardous exposures -- fumes
- C15 Hazardous exposures -- vapors
- C16 Hazardous exposures -- smoke or other combination of contaminants
- C17 Hazardous exposures -- material contact or skin absorption
- C18 Hazardous exposures -- inadvertent ingestion (food contaminants, etc.)
- C19 Hazardous exposures -- noise
- C20 Hazardous exposures -- ionizing radiation
- C21 Hazardous exposures -- nonionizing radiation

C22 Hazardous exposures -- heat  
C23 Hazardous exposures -- cold  
C24 Hazardous exposures -- repetitive/awkward/forceful motion

- Risk Management

- M1 No baseline survey/inspection
- M2 Incomplete baseline survey/inspection
- M3 No annual survey/inspection
- M4 Incomplete annual survey/inspection
- M5 Uncharacterized hazard/exposure
- M6 Using respirators without training
- M7 Using respirators without fitting
- M8 Using respirators without medical qualification
- M9 Missing required physical examination
- M10 Inadequate physical examination
- M11 No fetal protection evaluation
- M12 Incomplete fetal protection evaluation

- Administrative

- 1. Reports

- A1 Missing exposure result reports
- A2 Missing physical exam reports
- A3 Other Inadequate or missing reports

- 2. Records

- A4 Inadequate training records
- A5 Inadequate sampling records
- A6 Inadequate medical records
- A7 Inadequate inspection/survey records
- A8 Other inadequate records



## **SAFETY**

### **Acronym List**

<b>Acronym</b>	<b>Expansion</b>
AC	alternating current
AFFF	aqueous film forming foam
AFI	Air Force Instructions
ANG	Air National Guard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASAE	American Society of Agricultural Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	Automotive Welding Society
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CPR	cardiopulmonary resuscitation
CS	commercial standard
DC	direct current
DOD	Department of Defense
DOT	Department of Transportation
FRP	fiberglass reinforced plastic
IDLH	immediately dangerous to life or health
LFL	lower flammable limit
NHTSA	National Highway Traffic Safety Administration
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Prevention Association
NIOSH	National Institute for Occupational Safety and Health
NTP	Normal Temperature and Pressure
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
SAE	Society of Automotive Engineers
UDMH	unsymmetrical dimethyl hydrazine



### Abbreviations

Bq	becquerel	m <sup>3</sup>	cubic meter
C	Celsius	mi	mile
cc	cubic centimeters	mg	milligram
CF	cubic feet	mgd	million gallons per day
Ci	Curie	μg	microgram
cm	centimeter	μm	micrometer
cm <sup>2</sup>	square centimeter	min	minute
f	fiber	MPa	megapascals
F	Fahrenheit	mph	miles per hour
ft	feet	mo	month
ft <sup>2</sup>	square feet	mm	millimeter
ft <sup>3</sup>	cubic feet	mm Hg	millimeters of Mercury
g	gram	mrem	millirem
gal	gallons	mSv	millisievert
gpd	gallons per day	MW	MegaWatt
gpm	gallons per minute	NTU	nephelometric turbidity unit
gr	grain	pCi	picoCurie
gr/dscf	grain/dry standard cubic foot	ppm	parts per million
h	hour	ppmv	parts per million by volume
in.	inch	psi	pounds per square inch
J	Joule	psia	pounds per square inch absolute
kg	kilogram	psig	pounds per square inch gauge
kPa	kiloPascal	qt	quart
kW	kiloWatt	s	second
L	liter	S.F.P.M.	surface feet per minute
lb	pound	Sv	sievert
m	meter	V	volt
m <sup>2</sup>	square meter	yr	year



## **CHAPTER 38**

### **BASIC PROGRAM ELEMENTS**

## CHAPTER 38

### SAFETY: BASIC PROGRAM ELEMENTS

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Injury (Traumatic)* - a wound or other condition of the body caused by external force, including stress or strain. The injury is identifiable as to time and place of occurrence and member or function of the body affected, and is caused by a specific event or incident or series of events or incidents within a single day or work shift (29 CFR 1960.2(l)(1)).
- *Inspection* - a comprehensive survey of all or part of a workplace in order to detect safety and health hazards. Inspections are normally performed during the regular installation work hours, except as special circumstances may require. Inspections do not include routine, day-to-day visits by Air Force occupational safety and health personnel, or routine workplace surveillance of occupational health conditions (29 CFR 1960.2(k)).
- *Workplace* - a physical location where the Air Force's work or operations are performed (29 CFR 1960.2(t)).



## **SAFETY: BASIC PROGRAM ELEMENTS**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	BA.10.1 through BA.10.12	38-5
Injury Investigation	BA.20.1 through BA.20.4	38-9
Documentation	BA.30.1 through BA.30.7	38-11
Medical Services and First Aid	BA.40.1 through BA.40.3	38-13



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BA.10 GENERAL REQUIREMENTS</b></p> <p><b>BA.10.1.</b> Installation personnel must have safe and healthful work environments where recognized hazards are eliminated or controlled at acceptable levels (AFI 91-301, para 2.8.7).</p> <p><b>BA.10.2.</b> Each installation must establish a program to abate hazards and deficiencies (AFI 91-301, para 18.4).</p> <p><b>BA.10.3.</b> Hazard abatement projects beyond the capability of local commanders must be sent to the parent MAJCOM DRU or FOA (AFI 91-301, para 18.4).</p>	<p>Verify that installation personnel have safe and healthful work environments where recognized hazards are eliminated or controlled at acceptable levels.</p> <p>Verify that, if unsafe and unhealthful conditions exist, they are eliminated or controlled using appropriate techniques such as:</p> <ul style="list-style-type: none"> <li>- engineering</li> <li>- substitution</li> <li>- isolation</li> <li>- administrative controls</li> <li>- revised procedures</li> <li>- special training</li> <li>- PPE.</li> </ul> <p>(NOTE: The point of this checklist item is to ensure that, if there are recognized hazards, action has been taken to abate them.)</p> <p>(NOTE: Among the areas that assessors might consider in evaluating compliance with this checklist item are:</p> <ul style="list-style-type: none"> <li>- ergonomics</li> <li>- heat-related stress</li> <li>- cold-related stress.)</li> </ul> <p>Verify that the installation has established a program to abate hazards and deficiencies.</p> <p>Verify that the program is based on a priority system involving Risk Assessment Codes (RACs).</p> <p>Verify that hazard abatement projects beyond the capability of local commanders are sent to the parent MAJCOM, DRU, or FOA.</p> <p>(NOTE: The functional manager is responsible for abating hazardous conditions.)</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<b>BA.10.4.</b> Installation Ground Safety Managers must conduct workplace safety inspections and report results to appropriate management officials (AFI 91-301, para 2.9.2 and 8).	<p>Verify that the Installation Ground Safety Manager conducts workplace safety inspections in accordance with the requirements of AFI 91-202, <i>The US Air Force Mishap Prevention Program</i>.</p> <p>Verify that the Installation Ground Safety Manager reports results to appropriate management officials.</p>
<b>BA.10.5.</b> Workplace supervisors must post notices identifying RAC 1, 2, and 3 hazards (AFI 91-301, para 18).	<p>Verify that workplace supervisors post notices (AF form 1118) identifying RAC 1, 2, and 3 hazards to alert employees to the following:</p> <ul style="list-style-type: none"> <li>- the hazardous condition</li> <li>- any interim control measures in effect</li> <li>- permanent corrective actions underway or programmed.</li> </ul> <p>Verify that notices are posted on, at, or as near as possible to the hazard.</p> <p>Verify that, where the nature of the hazard is such that posting on, at, or as near as possible to the hazard is not practical, the notices are posted in a prominent place where they can be seen by all affected employees.</p> <p>Verify that notices are not removed until the hazard has been corrected or for 3 days, whichever is greater.</p> <p>Verify that notices are removed only after verification by the issuing authority that the identified hazard has been satisfactorily corrected.</p> <p>(NOTE: Qualified safety, fire protection, and BE officials are the sole issuing authorities for AF Form 1118.)</p>
<b>BA.10.6.</b> Air Force personnel must report safety, fire, and health hazards and deficiencies promptly (AFI 91-202, paras 2.15.2 and 12; 29 CFR 1960.10(c)).	<p>Verify that personnel report safety, fire, and health hazards and deficiencies promptly in accordance with the requirements of AFI 91-202, <i>The US Air Force Mishap Prevention Program</i>.</p>
<b>BA.10.7.</b> Occupational safety and health program information must be disseminated to personnel (29 CFR 1960.12(a) through (d)).	<p>Verify that copies of the following are made available upon request to personnel for review:</p> <ul style="list-style-type: none"> <li>- the <i>Occupational Safety and Health Act of 1970</i> (29 U.S.C. 651 et seq.)</li> <li>- Executive Order 12196</li> <li>- the program elements of 29 CFR 1960</li> <li>- details of the Air Force's occupational safety and health program</li> <li>- applicable safety and health standards.</li> </ul>

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<p><b>BA.10.8.</b> Information must be provided to personnel who conduct inspections (29 CFR 1960.26(a)(1) and 1960.71(a)).</p> <p><b>BA.10.9.</b> Employee reports or complaints of unhealthy conditions must be investigated on a specific timetable (29 CFR 1960.28(d)(3) and DODI 6055.1, Encl 2, para 3.a.(7)).</p>	<p>Verify that a copy of the Air Force's written occupational safety and health program applicable to the installation is made available to supervisory personnel.</p> <p>Verify that a poster informing personnel of the provisions of the following is conspicuously posted:</p> <ul style="list-style-type: none"> <li>- the <i>Occupational Safety and Health Act of 1970</i> (29 U.S.C. 651 et seq.)</li> <li>- Executive Order 12196</li> <li>- the Air Force's occupational safety and health program.</li> </ul> <p>Verify that the poster:</p> <ul style="list-style-type: none"> <li>- remains posted</li> <li>- is not altered, defaced, or covered by other material.</li> </ul> <p>(NOTE: The Department of Labor (DOL) will furnish the core text of a poster.)</p> <p>Verify that the installation adds the following to the core text of the DOL poster:</p> <ul style="list-style-type: none"> <li>- details of the Air Force's procedures for responding: <ul style="list-style-type: none"> <li>- to reports by personnel of unsafe or unhealthful working conditions</li> <li>- to allegations of discrimination or reprisal due to participation in safety and/or health activities</li> </ul> </li> <li>- the location where personnel may obtain information about the Air Force's occupational safety and health program, including the full text of the Air Force's occupational safety and health standards</li> <li>- relevant information about any AF safety and health committees.</li> </ul> <p>Verify that all available relevant information which pertains to the occupational safety and health of the workplace to be inspected is made available prior to the survey.</p> <p>(NOTE: This requirement includes, but is not limited to, the following:</p> <ul style="list-style-type: none"> <li>- safety and health hazard reports</li> <li>- injury and illness records</li> <li>- previous inspection reports</li> <li>- reports of unsafe and unhealthful working conditions.)</li> </ul> <p>Verify that employee reports or complaints of unhealthy conditions are investigated as follows:</p> <ul style="list-style-type: none"> <li>- within 24 h for reports of imminent danger conditions</li> <li>- within 3 working days for potentially serious conditions</li> <li>- within 20 working days for safety and health conditions that are other than serious.</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>BA.10.10.</b> Notices of Unsafe or Unhealthful Working Conditions must meet specific requirements (29 CFR 1960.26(c)(2)).</p> <p><b>BA.10.11.</b> Notices of Unsafe or Unhealthful Working Conditions must be posted in accordance with specific requirements (29 CFR 1960.26(c)(3) and (4)).</p>	<p>Verify that the notice is in writing and describes with particularity the nature and degree of seriousness of the unsafe or unhealthful working condition.</p> <p>Verify that the notice includes a reference to the standard or other requirement involved.</p> <p>Verify that the notice fixes a reasonable time for abatement of the unsafe or unhealthful working condition.</p> <p>Verify that Notices of Unsafe or Unhealthful Working Conditions (or copies thereof) are posted at or near each place an unsafe or unhealthful working condition referred to in the notice exists or existed.</p> <p>Verify that, if it is not practicable to post the notice at or near each workplace because of the nature of the workplace operations, such notice is posted in a prominent place where it will be readily observable by all affected employees.</p> <p>(NOTE: For example, where workplace activities are physically disperse, the notice may be posted at the location to which employees report each day. Where employees do not primarily work at or report to a single location, the notice may be posted at the location from which the employees operate to carry out their activities.)</p> <p>Verify that, in addition, a notice is posted if any special procedures are in effect.</p> <p>Verify that Notices of Unsafe or Unhealthful Working Conditions are posted unedited, except for reasons of national security.</p> <p>Verify that the Notice, or a copy thereof, remains posted until the unsafe or unhealthful working condition has been abated or for 3 working days, whichever is later.</p>
<p><b>BA.10.12.</b> The procedures for correcting unsafe or unhealthful working conditions must include a follow-up, to the extent necessary, to determine whether the correction was made (29 CFR 1960.30(b)).</p>	<p>Verify that the procedures for correcting unsafe or unhealthful working conditions include a follow-up, to the extent necessary, to determine whether the correction was made.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BA.20</b>  <b>INJURY INVESTIGATION</b></p> <p><b>BA.20.1.</b> Within 6 days after receiving information of an occupational injury or illness, appropriate information must be entered on the installation's log of occupational injuries and illnesses (29 CFR 1960.67(b)).</p> <p><b>BA.20.2.</b> Certain accidents must be investigated to determine causal factors involved (29 CFR 1960.29(b)).</p> <p><b>BA.20.3.</b> Investigative reports must include certain information (29 CFR 1960.29(d)).</p> <p><b>BA.20.4.</b> PH must initiate an AF Form 190, <i>Occupational Illness/ Injury Report</i>, for each suspected and confirmed occupational illness (AFI 91-204, para 4.12.2.1).</p>	<p>(NOTE: While all accidents must be investigated, the extent of such investigation is to be reflective of the seriousness of the accident.)</p> <p>Verify that appropriate information concerning an occupational injury or illness is entered on the installation's log of occupational injuries and illnesses within 6 days of receiving information of that occupational injury or illness.</p> <p>Verify that each accident that results in a fatality or the hospitalization of 5 or more personnel is investigated to determine the casual factors involved.</p> <p>Verify that evidence at the scene of an accident is left untouched until inspectors have an opportunity to examine it.</p> <p>(NOTE: This requirement does not apply to the extent necessary to protect personnel and the public.)</p> <p>Verify that the investigative report of an accident includes appropriate documentation on:</p> <ul style="list-style-type: none"> <li>- date</li> <li>- time</li> <li>- location</li> <li>- description of operations</li> <li>- description of accident</li> <li>- photographs</li> <li>- interviews of personnel and witnesses</li> <li>- measurements</li> <li>- other pertinent information.</li> </ul> <p>Verify that PH initiates an AF Form 190, <i>Occupational Illness/Injury Report</i>, for each suspected or confirmed occupational illness.</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>BA.30 DOCUMENTATION</b></p> <p><b>BA.30.1.</b> Certain records of occupational injuries and illnesses must be maintained at each installation (29 CFR 1960.67 and 1960.68).</p> <p><b>BA.30.2.</b> The Base Safety Office must use the AF Form 739 information to prepare the annual summary of occupational injuries (AFI 91-204, para 4.12.3, and 29 CFR 1960.69).</p> <p><b>BA.30.3.</b> The annual summary must be posted or disseminated to personnel (29 CFR 1960.71(d)).</p> <p><b>BA.30.4.</b> Reports on safety surveys must be written to the shop supervisor and to the employee representative who participated in the closing conference (if any) (29 CFR 1960.26(c)(2) and DODI 6055.1, Encl 2, para 3.a.(7)).</p> <p><b>BA.30.5.</b> Information must be used to identify hazardous conditions and establish priorities (29 CFR 1960.66(c)).</p>	<p>Verify that the following are maintained at each installation:</p> <ul style="list-style-type: none"> <li>- a log of occupational injuries and illnesses</li> <li>- a supplementary record of occupational injuries and illnesses.</li> </ul> <p>Verify that the Base Safety Office uses the information provided on the AF Form 739 to prepare the annual summary of occupational injuries.</p> <p>Verify that a copy of the annual summary is either:</p> <ul style="list-style-type: none"> <li>- posted at each installation not later than 45 calendar days after the close of the fiscal year</li> <li>- otherwise disseminates a copy of the annual summary for the installation to all personnel.</li> </ul> <p>Verify that the annual summary is posted for a minimum of 30 consecutive days in a conspicuous place or places in the installation where notices to personnel are customarily posted.</p> <p>Verify that the summary is not altered, defaced, or covered by other material.</p> <p>Verify that reports on occupational health surveys are written to the shop supervisor and to the employee representative who participated in the closing conference (if any).</p> <p>Verify that such reports are written within 15 days of the completion of the investigation or survey.</p> <p>Verify that these reports are forwarded to functional managers or commanders to ensure correction of deficiencies.</p> <p>Verify that the Air Force utilizes the information collected through its management information system to:</p> <ul style="list-style-type: none"> <li>- identify unsafe and unhealthful working conditions</li> <li>- establish program priorities.</li> </ul>

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<p><b>BA.30.6.</b> Written reports of workplace inspections must be retained on file until the deficiencies have been corrected and for at least 5 yr thereafter (DODI 6055.1, Encl 2, para 3.a.(7)).</p>	<p>Verify that written reports of workplace inspections are retained on file until the deficiencies have been corrected and for at least 5 yr thereafter.</p>
<p><b>BA.30.7.</b> Records and reports maintained for the safety program must be retained for specified periods of time (29 CFR 1960.73).</p>	<p>Verify that records and reports maintained for the safety program are retained for 5 yr following the end of the fiscal year to which they relate.</p> <p>Verify that all information in the safety case file is retained for 70 yr.</p>

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<p><b>BA.40</b>  <b>MEDICAL SERVICES AND FIRST AID</b></p> <p><b>BA.40.1.</b> Employers must ensure the ready availability of medical personnel for advice and consultation (29 CFR 1910.151(a)).</p> <p><b>BA.40.2.</b> Certain workplaces must contain persons trained in first aid and approved first aid supplies (29 CFR 1910.151(b)).</p> <p><b>BA.40.3.</b> The installation must provide quick drenching/flushing facilities in certain situations (29 CFR 1910.151(c)).</p>	<p>Verify that the employer ensures the ready availability of medical personnel for advice and consultation on matters of installation health.</p> <p>Determine whether there is an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees.</p> <p>Verify that, in the absence of such a facility, a person or persons is adequately trained to render first aid.</p> <p>Verify that first aid supplies are approved by the consulting physician are readily available.</p> <p>Verify that such first aid supplies are readily available.</p> <p>Determine whether the eyes or body of any person could be exposed to injurious corrosive materials.</p> <p>Verify that, in such situations, suitable facilities for quick drenching or flushing of the eyes and body is provided within the work area for immediate emergency use.</p>



## **CHAPTER 39**

### **ILLNESS AND INJURY REPORTING**

## CHAPTER 39

### SAFETY: ILLNESS AND INJURY REPORTING

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Act* - the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1590 et seq., 29 USC 651 et seq.) (29 CFR 1904.12).
- *Establishment* - a single physical location where business is conducted or where services or industrial operations are performed. (For example: A factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office.) Where distinctly separate activities are performed at a single physical location (such as contract construction activities operated from the same physical location as a lumber yard), each activity shall be treated as a separate establishment. For firms engaged in activities such as agriculture, construction, transportation, communications, and electric, gas and sanitary services, which may be physically dispersed, records may be maintained at a place to which employees report each day. Records for personnel who do not primarily report or work at a single establishment, and who are generally not supervised in their daily work, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities (29 CFR 1904.12).
- *First Aid* - any one-time treatment, and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment, and follow-up visit for the purpose of observation, is considered first aid even though provided by a physician or registered professional personnel (29 CFR 1904.12).
- *Lost Workdays* - the number of days (consecutive or not) after, but not including, the day of injury or illness during which the employee would have worked but could not do so; that is, could not perform all or any part of his normal assignment during all or any part of the workday or shift, because of the occupational injury or illness (29 CFR 1904.12).
- *Medical Treatment* - treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered professional personnel (29 CFR 1904.12).
- *Recordable Occupational Injuries or Illnesses* - any occupational injuries or illnesses which result in:
  - (1) fatalities, regardless of the time between the injury and death, or the length of the illness
  - (2) lost workday cases, other than fatalities, that result in lost workdays
  - (3) nonfatal cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases (29 CFR 1904.12).



## EOH: ILLNESS AND INJURY REPORTING

### GUIDANCE FOR CHECKLIST USERS

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Reporting of Occupational Illness and Injuries	LG.10.1 through LG.10.3	39-5
Log and Summary of Occupational Injuries and Illnesses	LG.20.1 through LG.20.4	39-7
Annual Summary	LG.30.1 and LG.30.2	39-9
Records: Retention, Access, and Availability	LG.40.1 through LG.40.3	39-11
Reporting of Fatality or Multiple Hospitalization Incidents	LG.50.1 and LG.50.2	39-13



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>LG.10</b>  <b>REPORTING OF</b>  <b>OCCUPATIONAL</b>  <b>ILLNESSES AND</b>  <b>INJURIES</b></p> <p><b>LG.10.1.</b> Procedures must be developed to identify and report occupational injuries to the base safety office (AFI 91-204, para 4.12.2).</p>	<p>Verify that procedures have been developed to identify and report occupational injuries to the base safety office.</p> <p>(NOTE: This requirement applies to the occupational injuries of both military and civilian personnel.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>LG.20</b>  <b>LOG AND SUMMARY OF OCCUPATIONAL INJURIES AND ILLNESSES</b></p> <p><b>LG.20.1.</b> Installations must meet specific requirements with regard to the maintenance of and entry of data into a log and summary of all recordable occupational injuries and illnesses (29 CFR 1904.2(a)).</p> <p><b>LG.20.2.</b> Installations must meet specific requirements if the log of occupational injuries and illnesses is maintained by means of data-processing equipment (29 CFR 1904.2(b)).</p> <p><b>LG.20.3.</b> Installations must keep log- and summary-related records on a calendar year basis (29 CFR 1904.3).</p> <p><b>LG.20.4.</b> Installations must meet specific requirements with regard to the maintenance of supplementary records (29 CFR 1904.4).</p>	<p>Verify that the installation maintains a log and summary of all recordable occupational injuries and illnesses.</p> <p>Verify that each recordable injury and illness is entered on the log and summary as early as practicable but no later than 6 working days after receiving information that a recordable injury or illness has occurred.</p> <p>Verify that Form OSHA No. 200 is used for this purpose.</p> <p>(NOTE: An equivalent of Form OSHA No. 200 may be used if it is as readable and comprehensible to a person not familiar with it as the OSHA document.)</p> <p>Verify that the log and summary is completed in the detail provided in the form and instructions on Form OSHA No. 200.</p> <p>Determine whether the installation's log is maintained by means of data-processing equipment.</p> <p>Verify that there is available at the place where the log is maintained sufficient information to complete the log to a date within 6 working days after receiving information that a recordable case has occurred.</p> <p>Verify that there is available a copy of the log that reflects separately the injury and illness experience of that establishment complete and current to a date within 45 calendar days.</p> <p>Verify that the installation keeps log- and summary-related records on a calendar year basis.</p> <p>Verify that, in addition to the log of occupational injuries and illnesses, the installation has available for inspection a supplementary record for each occupational injury or illness.</p> <p>Verify that the supplementary record is available for inspection within 6 working days after receiving information that a recordable case has occurred.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
	<p>Verify that the supplementary record is completed in the detail prescribed in the instructions accompanying Form OSHA No. 101.</p> <p>(NOTE: Workmen's compensation, insurance, or other reports are acceptable alter-native records, if they contain the information required by Form OSHA No. 101.)</p> <p>Verify that, if no acceptable alternative record is maintained for other purposes, Form OSHA No. 101 is maintained or that the necessary information is otherwise maintained.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>LG.30</b>  <b>ANNUAL SUMMARY</b></p> <p><b>LG.30.1.</b> Installations must post an annual summary of occupational injuries and illnesses that meets specific requirements (29 CFR 1904.5(a) through 1904.5 (c)).</p> <p><b>LG.30.2.</b> Installations must meet specific requirements with regard to posting copies of the annual summary (29 CFR 1904.5(d)).</p>	<p>Verify that the installation posts an annual summary of occupational injuries and illnesses.</p> <p>Verify that the summary consists of a copy of the year's totals from the Form OSHA No. 200 and the following information from that form:</p> <ul style="list-style-type: none"> <li>- calendar year covered</li> <li>- name of the installation</li> <li>- address of the installation</li> <li>- certification signature, title, and date.</li> </ul> <p>Verify that a Form OSHA No. 200 is used in presenting the summary.</p> <p>Verify that, if no injuries or illnesses occurred in the year, a form is posted that has zeros entered on the totals line.</p> <p>Verify that the form is completed by 1 February.</p> <p>Verify that person who supervises the preparation of the log and summary of occupational injuries and illnesses certifies that the annual summary of occupational injuries and illnesses is true and complete.</p> <p>Verify that certification is accomplished either by:</p> <ul style="list-style-type: none"> <li>- affixing the signature of the person who supervises the preparation at the bottom of the last page of the log and summary, or</li> <li>- by appending a separate statement to the log and summary certifying that the summary is true and complete.</li> </ul> <p>Verify that copies of the summary are posted in a conspicuous place or places where notices to employees are customarily posted.</p> <p>Verify that steps are taken to ensure that such copies are not altered, defaced, or covered by other material.</p> <p>Verify that the summary covering the previous calendar year is posted no later than 1 February.</p> <p>Verify that the posted summary remains in place until 1 March.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
	<p>(NOTE: For employees who do not primarily report or work at any fixed establishment on a regular basis, the posting requirement is satisfied by presenting or mailing a copy of the summary during the month of February of the following year to each such employee who receives pay during that month.)</p> <p>(NOTE: Failure to post a copy of the annual summary may result in the issuance of citations and the assessment of penalties by OSHA.)</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>LG.40</b>  <b>RECORDS: RETENTION, ACCESS, AND AVAILABILITY</b></p> <p><b>LG.40.1.</b> Certain records are subject to retention requirements (29 CFR 1904.6).</p> <p><b>LG.40.2.</b> Installations must meet specific requirements with regard to access to records (29 CFR 1904.7(a)).</p> <p><b>LG.40.3.</b> The log and summary of all recordable occupational injuries and illnesses (OSHA No. 200) must be made available to employees, former employees, and/or their representatives (29 CFR 1904.7(b)).</p>	<p>(NOTE: Failure to maintain records or file reports required by 29 CFR 1904 or failure to make them in the level of detail required by forms and instructions issued under 29 CFR 1904 may result in the issuance of citations and assessment of penal-ties.)</p> <p>(NOTE: Records maintained by an employer and reports submitted pursuant to and in accordance with the requirements of an approved State plan are regarded as compliance with 29 CFR 1904.)</p> <p>Verify that the installation retains the following records for 5 yr following the end of the year to which they relate:</p> <ul style="list-style-type: none"> <li>- log and summary of occupational injuries and illnesses</li> <li>- supplementary records required by 29 CFR 1904.4 (see checklist item LG.20.4)</li> <li>- annual summary.</li> </ul> <p>Verify that, upon request, the installation provides copies of the following records for inspection and copying:</p> <ul style="list-style-type: none"> <li>- log and summary of occupational injuries and illnesses</li> <li>- supplementary records required by 29 CFR 1904.4 (see checklist item LG.20.4)</li> <li>- annual summary.</li> </ul> <p>(NOTE: The following parties may request copies of the records for inspection and copying:</p> <ul style="list-style-type: none"> <li>- any representative of the Secretary of Labor for the purpose of carrying out the provisions of the Act</li> <li>- representatives of the Secretary of Health, Education, and Welfare during investigations under section 20(b) of the Act</li> <li>- any representative of a state accorded jurisdiction for occupational safety and health inspections or for statistical compilation under sections 18 and 24 of the Act.)</li> </ul> <p>Verify that the log and summary of all recordable occupational injuries and illnesses is made available to employees, former employees, and/or their representatives.</p> <p>(NOTE: Employees have access to the log for any installation in which they are now or have been employed.)</p>

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	<p>(NOTE: Nothing in 29 CFR 1904.7 precludes employees and employee representatives from collectively bargaining to obtain access to information relating to occupational injuries and illnesses in addition to the information made available under the requirements in this checklist item.)</p> <p>(NOTE: Access to the log pertains to all logs retained under the provisions of 29 CFR 1904.6 (see checklist item LG.40.1).)</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>LG.50</b>  <b>REPORTING OF FATALITY OR MULTIPLE HOSPITALIZATION INCIDENTS</b></p> <p><b>LG.50.1.</b> Installations must meet specific reporting requirements in certain circumstances (29 CFR 1904.8 (a) through 1904.8 (c)).</p> <p><b>LG.50.2.</b> Reports of fatalities/multiple hospitalizations must include specific information (29 CFR 1904.8(d)).</p>	<p>(NOTE: Failure to maintain records or file reports required by 29 CFR 1904 or failure to make them in the level of detail required by forms and instructions issued under 29 CFR 1904 may result in the issuance of citations and assessment of penalties.)</p> <p>(NOTE: Records maintained by an employer and reports submitted pursuant to and in accordance with the requirements of an approved State plan are regarded as compliance with 29 CFR 1904.)</p> <p>Determine whether the installation has experienced either of the following:</p> <ul style="list-style-type: none"> <li>- the death of any employee after a work-related incident</li> <li>- the inpatient hospitalization of three or more employees as a result of a work-related incident.</li> </ul> <p>Verify that the fatality/multiple hospitalization was orally reported using one of the following means:</p> <ul style="list-style-type: none"> <li>- in person or by telephone to the Area Office of OSHA nearest to the site of the incident</li> <li>- by telephone using the OSHA toll-free central telephone number.</li> </ul> <p>Verify that such notification was made within 8 hr after the fatality/multiple hospitalization.</p> <p>(NOTE: The reporting requirements apply to each such fatality or hospitalization of three or more employees that occurs within 30 days of an incident.)</p> <p>(NOTE: If the installation does not learn of a reportable incident at the time it occurs and the incident would otherwise be reportable, the installation must make the report within 8 hr of the time the incident is reported to any agent or employee of the installation.)</p> <p>Determine whether the installation has had to make reports of fatalities/multiple hospitalizations.</p> <p>Verify that each such report contained the following information:</p> <ul style="list-style-type: none"> <li>- name of the installation</li> <li>- location of incident</li> <li>- time of incident</li> <li>- number of fatalities or hospitalized employees</li> <li>- contact person</li> <li>- phone number</li> <li>- brief description of the incident.</li> </ul>



## **CHAPTER 40**

### **PERSONAL PROTECTIVE EQUIPMENT**

## **CHAPTER 40**

### **SAFETY: PERSONAL PROTECTIVE EQUIPMENT**

**ECAMP-ANG**

**September 1997**

#### **Compliance Definitions**

- NONE



## SAFETY: PERSONAL PROTECTIVE EQUIPMENT

### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
Eye and Face Protection	SP.10.1 through SP.10.7	40-5
Head Protection	SP.20.1 through SP.20.4	40-7
Foot Protection	SP.30.1 through SP.30.3	40-9
Electrical Protective Equipment	SP.40.1 through SP.40.5	40-11
Hand Protection	SP.50.1 and SP.50.2	40-15

Appendix 40-1, <i>Filter Lenses for Protection Against Radiant Energy</i>	40-17
Appendix 40-2, <i>Rubber Insulating Equipment Voltage Requirements</i>	40-19
Appendix 40-3, <i>Rubber Insulating Equipment Test Intervals</i>	40-21



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SP.10</b>  <b>EYE AND FACE PROTECTION</b></p> <p><b>SP.10.1.</b> Installation employees must use appropriate eye or face protection when exposed to certain hazards (29 CFR 1910.133(a)(1)).</p> <p><b>SP.10.2.</b> Installation employees must use eye protection that provides side protection under certain circumstances (29 CFR 1910.133(a)(2)).</p> <p><b>SP.10.3.</b> Installation employees who wear prescription lenses must wear eye protection that accommodates the pre-scription (29 CFR 1910.133(a)(3)).</p> <p><b>SP.10.4.</b> Eye and face PPE must be distinctly marked to facilitate identification of the manufacturer (29 CFR 1910.133(a)(4)).</p> <p><b>SP.10.5.</b> Installation employees must use equipment with appropriate filter lenses (29 CFR 1910.133(a)(5)).</p> <p><b>SP.10.6.</b> Protective eye and face devices purchased after 5 July 1994 must comply with specific standards (29 CFR 1910.133(b)(1)).</p>	<p>Determine whether employees are exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.</p> <p>Verify that the installation ensures that affected employees use appropriate eye and face protection.</p> <p>Determine whether there is a hazard in the workplace from flying objects.</p> <p>Verify that the installation ensures that affected employees use eye protection that provides side protection.</p> <p>(NOTE: Detachable side protectors (e.g., clip-on or slide-on side shields) that meet the pertinent requirements of 29 CFR 1910.133 are acceptable.)</p> <p>Verify that the installation ensures that employees who are required to wear eye protection, and who also wear prescription lenses, wear eye protection that either:</p> <ul style="list-style-type: none"> <li>- incorporates the prescription in its design, or</li> <li>- can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.</li> </ul> <p>Verify that eye and face PPE are distinctly marked to facilitate identification of the manufacturer.</p> <p>Verify that the installation ensures that employees who are required to wear eye protection wear eye PPE with filter lenses that have a shade number appropriate for protection from injurious light radiation (see Appendix 40-1).</p> <p>Determine whether protective eye and face devices were purchased on or after 5 July 1994.</p> <p>Verify that protective eye and face devices either:</p> <ul style="list-style-type: none"> <li>- comply with ANSI Z87.1 - 1989, American National Standard Practice for Occupational and Educational Eye and Face Protection, or</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul>

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<b>SP.10.7.</b> Protective eye and face devices purchased before 5 July 1994 must comply with specific standards (29 CFR 1910.133(b)(2)).	Determine whether protective eye and face devices were purchased before 5 July 1994.  Verify that protective eye and face devices either: <ul style="list-style-type: none"> <li>- comply with ANSI Z87.1 - 1968, USA Standard for Occupational and Educational Eye and Face Protection</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul>

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<p><b>SP.20</b> <b>HEAD PROTECTION</b></p> <p><b>SP.20.1.</b> Installation employees must wear protective helmets under certain circumstances (29 CFR 1910.135(a)(1)).</p> <p><b>SP.20.2.</b> Installation employees must wear protective helmets designed to reduce electrical shock hazard under certain circumstances (29 CFR 1910.135(a)(2)).</p> <p><b>SP.20.3.</b> Protective helmets purchased after 5 July 1994 must comply with specific standards (29 CFR 1910.135(b)(1)).</p> <p><b>SP.20.4.</b> Protective helmets purchased before 5 July 1994 must comply with specific standards (29 CFR 1910.135(b)(2)).</p>	<p>Determine whether there is a potential for injury to the head from falling objects.</p> <p>Verify that the installation ensures that each affected employee wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects.</p> <p>Verify that the installation ensures that affected employees wear protective helmets designed to reduce electrical shock hazard when near exposed electrical conductors that could contact the head.</p> <p>Determine whether protective helmets were purchased on or after 5 July 1994.</p> <p>Verify that protective helmets either:</p> <ul style="list-style-type: none"> <li>- comply with ANSI Z89.1 - 1986, <i>American National Standard for Personnel Protection -- Protective Headwear for Industrial Workers - Requirements</i>, or</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul> <p>Determine whether protective helmets were purchased before 5 July 1994.</p> <p>Verify that protective helmets either:</p> <ul style="list-style-type: none"> <li>- comply with ANSI Z89.1 - 1969, <i>American National Standard Safety Requirements for Industrial Head Protection</i>, or</li> <li>- are demonstrated by the installation to be equally effective.</li> </ul>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SP.30</b>  <b>FOOT PROTECTION</b></p> <p><b>SP.30.1.</b> Installation employees must wear protective footwear under certain circumstances (29 CFR 1910.136(a)).</p> <p><b>SP.30.2.</b> Protective footwear purchased after 5 July 1994 must comply with specific standards (29 CFR 1910.136(b)(1)).</p> <p><b>SP.30.3.</b> Protective footwear purchased before 5 July 1994 must comply with specific standards (29 CFR 1910.136(b)(2)).</p>	<p>Determine whether:</p> <ul style="list-style-type: none"> <li>- there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole; or</li> <li>- employees' feet are exposed to electrical hazards</li> </ul> <p>Verify that the installation ensures that affected employees use protective footwear.</p> <p>Determine whether protective footwear was purchased on or after 5 July 1994.</p> <p>Verify that protective footwear either:</p> <ul style="list-style-type: none"> <li>- complies with ANSI Z41 - 1991, <i>American National Standard for Personnel Protection -- Protective Footwear</i>, or</li> <li>- is demonstrated by the installation to be equally effective.</li> </ul> <p>Determine whether protective footwear is purchased before 5 July 1994.</p> <p>Verify that protective helmets either:</p> <ul style="list-style-type: none"> <li>- complies with ANSI Z41.1 - 1967, <i>USA Standard for Men's Safety-Toe Footwear</i>, or</li> <li>- is demonstrated by the installation to be equally effective.</li> </ul>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SP.40</b>  <b>ELECTRICAL PROTECTIVE EQUIPMENT</b></p> <p><b>SP.40.1.</b> Electrical protective equipment must be maintained in a safe, reliable condition (29 CFR 1910.137(b)(1)).</p> <p><b>SP.40.2.</b> Insulating blankets, covers, line hose, gloves, and sleeves made of rubber must meet specific requirements (29 CFR 1910.137(b)(2)(i) through 1910.137(b)(2)(viii)).</p>	<p>Verify that electrical protective equipment is maintained in a safe, reliable condition.</p> <p>Verify that the maximum use voltages conform to those listed in Appendix 40-2.</p> <p>Verify that insulating equipment is inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage.</p> <p>Verify that insulating gloves are given an air test along with the inspection.</p> <p>Verify that insulating equipment with any of the following defects is not used:</p> <ul style="list-style-type: none"> <li>- a hole, tear, puncture, or cut</li> <li>- ozone cutting or ozone checking</li> <li>- an embedded foreign object</li> <li>- any of the following texture changes: <ul style="list-style-type: none"> <li>- swelling</li> <li>- softening</li> <li>- hardening</li> <li>- becoming sticky or inelastic</li> <li>- any other defect that damages the insulating properties.</li> </ul> </li> </ul> <p>(NOTE: Ozone cutting is the cutting action produced by ozone on rubber under mechanical stress into a series of interlacing cracks.)</p> <p>Verify that insulating equipment found to have other defects that might affect its insulating properties is removed from service and returned for testing.</p> <p>Verify that equipment is cleaned as needed to remove foreign substances.</p> <p>Verify that insulating equipment is stored in such a location and in such a manner as to protect it from:</p> <ul style="list-style-type: none"> <li>- light</li> <li>- temperature extremes</li> <li>- excessive humidity</li> </ul>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<p><b>SP.40.3.</b> Installations must comply with testing requirements (29 CFR 1910.137(b)(2)(viii)).</p> <p><b>SP.40.4.</b> Employees must not use equipment which fails to pass inspections or electrical tests (29 CFR 1910.137(b)(2)(x) and 1910.137(b)(2)(xi)).</p>	<ul style="list-style-type: none"> <li>- ozone</li> <li>- other injurious substances and conditions.</li> </ul> <p>Verify that protector gloves are worn over insulating gloves.</p> <p>(NOTE: Protector gloves need not be used:</p> <ul style="list-style-type: none"> <li>- with Class 0 gloves</li> <li>- under limited-use conditions</li> <li>- where small equipment and parts manipulation necessitate unusually high finger dexterity.)</li> </ul> <p>(NOTE: Extra care is needed in the visual examination of the glove and in the avoidance of handling sharp objects.)</p> <p>(NOTE: Any other class of glove may be used for similar work without protector gloves if the installation can demonstrate that the possibility of physical damage to the gloves is small and if the class of glove is one class higher than that required for the voltage involved.)</p> <p>(NOTE: Insulating gloves that have been used without protector gloves may not be used at a higher voltage until they have been tested.)</p> <p>Verify that electrical protective equipment is subjected to periodic electrical tests.</p> <p>Verify that test voltages and the maximum intervals between tests are in accordance with Appendix 40-2 and Appendix 40-3.</p> <p>(NOTE: 29 CFR 1910.137(b)(ix) contains the proper test methods for electrical protective equipment.)</p> <p>Verify that employees do not use insulating equipment that fails to pass inspections or electrical tests.</p> <p>(NOTE: This requirement does not apply to:</p> <ul style="list-style-type: none"> <li>- rubber insulating line hose which may be used in shorter lengths with the defective portion cut off</li> <li>- rubber insulating blankets which may be repaired using a compatible patch that results in physical and electrical properties equal to those of the blanket</li> <li>- rubber insulating blankets which may be salvaged by severing the defective area from the undamaged portion of the blanket. (The resulting undamaged area may not be smaller than 22 inches by 22 inches (560 mm by 560 mm).)</li> <li>- rubber insulating gloves and sleeves with minor physical defects, such as small cuts, tears, or punctures, may be repaired by the application of a compatible patch</li> <li>- rubber insulating gloves with minor surface blemishes which may be repaired with a compatible liquid compound. (The patched area shall have electrical and physical properties equal to those of the surrounding material. Repairs of gloves</li> </ul>

**COMPLIANCE CATEGORY:**  
**SAFETY: PERSONAL PROTECTIVE EQUIPMENT**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SP.40.5.</b> Installations must certify that equipment has been properly tested (29 CFR 1910.137(b)(2)(xii)).</p>	<p>are permitted only in the area between the wrist and the reinforced edge of the opening.)</p> <p>Verify that repaired insulating equipment is retested before it is used by employees.</p> <p>Verify that the installation certifies that equipment has been tested in accordance with the CFR requirements.</p> <p>Verify that this certification identifies the equipment that passed the test and the date it was tested.</p> <p>(NOTE: Marking of equipment and entering the results of the tests and the dates of the testing onto logs are two acceptable means of meeting this requirement.)</p>



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>SP.50</b>  <b>HAND PROTECTION</b></p> <p><b>SP.50.1.</b> Installations must select and require employees to use appropriate hand protection when exposed to certain hazards (29 CFR 1910.138(a)).</p> <p><b>SP.50.2.</b> Installations must base the selection of the appropriate hand protection on an evaluation of the certain characteristics of the hand protection (29 CFR 1910.138(b)).</p>	<p>Verify that the installation selects and requires employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from:</p> <ul style="list-style-type: none"> <li>- skin absorption of harmful substances</li> <li>- severe cuts or lacerations</li> <li>- severe abrasions</li> <li>- punctures</li> <li>- chemical burns</li> <li>- thermal burns</li> <li>- harmful temperature extremes.</li> </ul> <p>Verify that the installation bases the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to:</p> <ul style="list-style-type: none"> <li>- the task(s) to be performed</li> <li>- conditions present</li> <li>- duration of use</li> <li>- the hazards and potential hazards identified.</li> </ul>



## Appendix 40-1

### Filter Lenses for Protection Against Radiant Energy (29 CFR 1910.133(a)(5))

Operations	Electrode Size 1/32 in.	Arc Current	Minimum* Protective Shade
Shielded metal arc welding	less than 3	less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	more than 8	250-550	11
Gas metal arc welding and flux cored arc welding		less than 60	7
		60-160	10
		160-250	10
		250-500	10
Gas Tungsten arc welding		less than 50	8
		50-150	8
		150-500	10
Air carbon Air cutting	(light)	less than 500	10
	(heavy)	500-1000	11
Plasma arc welding		less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(light)**	less than 300	8
	(medium)**	300-400	9
	(heavy)**	400-800	10
Torch brazing Torch soldering Carbon arc welding			3
			2
			14

\* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

\*\* These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

**Filter Lenses for Protection Against Radiant Energy**  
(29 CFR 1910.133(a)(5))

<b>Operations</b>	<b>Plate thickness--inches</b>	<b>Plate thickness--mm</b>	<b>Minimum Protective Shade</b>
Gas welding:			
Light	under 1/8	under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	over 1/2	over 12.7	6
Oxygen cutting:			
Light	under 1	under 25	3
Medium	1 to 6	25 to 150	4
Heavy	over 6	over 150	5

## Appendix 40-2

### Rubber Insulating Equipment Voltage Requirements (29 CFR 1910.137, Table I-5)

Class of equipment	Maximum use voltage <sup>1</sup> a-c -- rms	Retest voltage <sup>2</sup> a-c -- rms	Retest voltage <sup>2</sup> d-c -- avg
0	1,000	5,000	20,000
1	7,500	10,000	40,000
2	17,000	20,000	50,000
3	26,500	30,000	60,000
4	36,000	40,000	70,000

<sup>1</sup> The maximum use voltage is the a-c voltage (rms) classification of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits. However, the phase-to-ground potential is considered to be the nominal design voltage:

(1) If there is no multiphase exposure in a system area and if the voltage exposure is limited to the phase-to-ground potential, or

(2) If the electrical equipment and devices are insulated or isolated or both so that the multiphase exposure on a grounded wye circuit is removed.

<sup>2</sup> The proof-test voltage shall be applied continuously for at least 1 min, but no more than 3 min.



### Appendix 40-3

#### Rubber Insulating Equipment Test Intervals (29 CFR 1910.137, Table I-6)

Type of equipment	When to test
Rubber insulating line hose	Upon indication that insulating value is suspect
Rubber insulating covers	Upon indication that insulating value is suspect
Rubber insulating blankets	Before first issue and every 12 mo thereafter <sup>1</sup>
Rubber insulating gloves	Before first issue and every 6 mo thereafter <sup>1</sup>
Rubber insulating sleeves	Before first issue and every 12 mo thereafter <sup>1</sup>

<sup>1</sup> If the insulating equipment has been electrically tested but not issued for service, it may not be placed into service unless it has been electrically tested within the previous 12 mo.



## **CHAPTER 41**

### **WALKING AND WORKING SURFACES**

## CHAPTER 41

### SAFETY: WALKING-WORKING SURFACES

#### ECAMP-ANG

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#### Compliance Definitions

- *Bark Pocket* - an opening between annual growth rings that contains bark (29 CFR 1910.21(c)(15)).
- *Cage* - a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder (29 CFR 1910.21(e)(11)).
- *Check* - a lengthwise separation of wood, most of which occurs across the rings of annual growth (29 CFR 1910.21(c)(17)).
- *Cleats* - ladder cross-pieces of rectangular cross-section placed on edge on which a person may step in ascending or descending (29 CFR 1910.21(e)(9)).
- *Compression Failure* - a deformation (buckling) of the fibers due to excessive compression along the grain (29 CFR 1910.21(c)(20)).
- *Compression Wood* - an aberrant (abnormal) and highly variable type of wood structure occurring in softwood species. The wood commonly has density somewhat higher than does normal wood, but somewhat lower stiffness and tensile strength for its weight in addition to high longitudinal shrinkage (29 CFR 1910.21(c)(21)).
- *Cross Grain (Slope of Grain)* - a deviation of the fiber direction from a line parallel to the sides of the piece (29 CFR 1910.21(c)(13)).
- *Decay* - disintegration of wood substance due to the action of wood-destroying fungi. It is also known as *dote* and *rot* (29 CFR 1910.21(c)(19)).
- *Extension Ladder* - a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails (29 CFR 1910.21(c)(4)) and (29 CFR 1910.21(d)(4)).
- *Extension Trestle Ladder* - a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base (29 CFR 1910.21(c)(7)) and (29 CFR 1910.21(d)(8)).
- *Fastening* - a device to attach a ladder to a structure, building, or equipment (29 CFR 1910.21(e)(7)).
- *Fixed Ladder* - a ladder permanently attached to a structure, building, or equipment (29 CFR 1910.21(e)(2)).
- *Floor Hole* - an opening measuring less than 12 in. but more than 1 in. in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening (29 CFR 1910.21(a)(1)).
- *Floor Opening* - an opening measuring 12 in. or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole.

Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from 29 CFR 1910.23 (29 CFR 1910.21(a)(2)).

- *Grab Bars* - individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder (29 CFR 1910.21(e)(14)).
- *Handrail* - a single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a continuous handhold in case of tripping (29 CFR 1910.21(a)(3), 1910.21(b)(1)).
- *Individual-Rung Ladder* - a fixed ladder each rung of which is individually attached to a structure, building, or equipment (29 CFR 1910.21(e)(3)).
- *Knot* - a branch or limb, imbedded in the tree and cut through in the process of lumber manufacture, classified according to size, quality, and occurrence. The size of the knot is determined as the average diameter on the surface of the piece (29 CFR 1910.21(c)(14)).
- *Ladder* - an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending (29 CFR 1910.21(c)(1), 1910.21(d)(1)) and 1910.21(e)(1)).
- *Ladder Safety Device* - any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments (29 CFR 1910.21(e)(13)).
- *Low density* - wood which is exceptionally light in weight and usually deficient in strength properties for the species (29 CFR 1910.21(c)(22)).
- *Masons' Ladder* - a special type of single ladder intended for use in heavy construction work (29 CFR 1910.25(c)(4)).
- *Nose (or Nosing)* - that portion of a tread projecting beyond the face of the riser immediately below (29 CFR 1910.21(b)(2)).
- *Open Riser* - the air space between the treads of stairways without upright members (risers) (29 CFR 1910.21(b)(3)).
- *Pitch* - the included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side (29 CFR 1910.21(e)(6)).
- *Pitch Pocket* - an opening extending parallel to the annual growth rings containing, or that has contained, pitch, either solid or liquid (29 CFR 1910.21(c)(15)).
- *Platform* - in reference to a floor or wall opening, a platform means a working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment (29 CFR 1910.21(a)(4)).
- *Platform* - in reference to fixed industrial stairs, a platform means an extended step or landing breaking a continuous run of stairs (29 CFR 1910.21(b)(4)).
- *Platform Ladder* - a self-supporting ladder of fixed size with a platform provided at the working level. The size is determined by the distance along the front rail from the platform to the base of the ladder (29 CFR 1910.21(d)(5)).

- *Push Stick* - a narrow strip of wood or other soft material with a notch cut into one end and which is used to push short pieces of material through saws (29 CFR 1910.211(a)(2)).
- *Railing* - a vertical barrier erected along exposed sides of stairways and platforms to prevent falls of persons. The top member of railing usually serves as a handrail (29 CFR 1910.21(b)(5)).
- *Rail Ladder* - a fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment (29 CFR 1910.21(e)(4)).
- *Rise* - the vertical distance from the top of a tread to the top of the next higher tread (29 CFR 1910.21(b)(6)).
- *Riser* - the upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread (29 CFR 1910.21(b)(7)).
- *Rungs* - ladder cross-pieces of circular or oval cross-section on which a person may step in ascending or descending (29 CFR 1910.21(e)(8)).
- *Runway* - regarding walking-working surfaces, a runway is a passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings (29 CFR 1910.21(a)(5)).
- *Sectional Ladder* - a non-self-supporting portable ladder, nonadjustable in length, consisting of two or more sections of ladder so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections (29 CFR 1910.21(c)(5)) and (29 CFR 1910.21(d)(6)).
- *Shake* - a separation along the grain, most of which occurs between the rings of annual growth (29 CFR 1910.21(c)(16)).
- *Side-rolling Ladder* - a semifixed ladder, nonadjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also its plane of motion (29 CFR 1910.21(c)(10)).
- *Side-Step Ladder* - a ladder from which a person getting off at the top must step sideways from the ladder in order to reach the landing (29 CFR 1910.21(e)(16)).
- *Single Ladder* - a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail (29 CFR 1910.21(c)(3)) and (29 CFR 1910.21(d)(3)).
- *Special-Purpose Ladder* - a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders defined here, in order to adapt the ladder to special or specific uses (29 CFR 1910.21(c)(8)) and 1910.21(d)(9)).
- *Stair Railing* - a vertical barrier erected along exposed sides of a stairway to prevent falls of persons (29 CFR 1910.21(a)(8)).
- *Stairs, Stairway* - regarding fixed industrial stairs, a series of steps leading from one level or floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees, or only occasionally by specific individuals. A series of steps and landings having three or more risers constitutes stairs or stairway (29 CFR 1910.21(b)(8)).
- *Standard Railing* - a vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons (29 CFR 1910.21(a)(6)).

- *Standard Strength and Construction* - any construction of railings, covers, or other guards that meets the requirements of 29 CFR 1910.23 (29 CFR 1910.21(a)(7)).
- *Stepladder* - a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails (29 CFR 1910.21(c)(2)) and (29 CFR 1910.21(d)(2)).
- *Steps* - the flat cross-pieces of a ladder on which a person may step in ascending or descending (29 CFR 1910.21(e)(10)).
- *Through Ladder* - a ladder from which a person getting off at the top must step through the ladder in order to reach the landing (29 CFR 1910.21(e)(15)).
- *Toeboard* - a vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials (29 CFR 1910.21(a)(9)).
- *Tread* - the horizontal member of a step (29 CFR 1910.21(b)(9)).
- *Tread Run* - the horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread (29 CFR 1910.21(b)(10)).
- *Tread Width* - the horizontal distance from front to back of tread including nosing when used (29 CFR 1910.21(b)(11)).
- *Trestle Ladder* - a self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge (29 CFR 1910.21(c)(6)) and (29 CFR 1910.21(d)(7)).
- *Trolley Ladder* - a semifixed ladder, nonadjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion (29 CFR 1910.21(c)(9)).
- *Wall Hole* - an opening less than 30 in. but more than 1 in. high, of unrestricted width, in any wall or partition, such as a ventilation hole or a drainage scupper (29 CFR 1910.21(a)(10)).
- *Wall Opening* - an opening at least 30 in. high and 18 in. wide, in any wall or partition, through which persons may fall; such as a yard-arm doorway or chute opening (29 CFR 1910.21(a)(11)).
- *Wane* - bark, or the lack of wood from any cause, on the corner of a piece (29 CFR 1910.21(c)(18)).
- *Well* - a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage (29 CFR 1910.21(e)(12)).
- *Wood Characteristics* - distinguishing features which by their extent and number determine the quality of a piece of wood (29 CFR 1910.21(c)(11)).
- *Wood Irregularities* - natural characteristics in or on wood that may lower its durability, strength, or utility (29 CFR 1910.21(c)(12)).

## **SAFETY: WALKING-WORKING SURFACES**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	WS.10.1 through WS.10.8	41-7
Guarding Floor and Wall Openings	WS.20.1 through WS.20.37	41-9
Fixed Industrial Stairs	WS.30.1 through WS.30.9	41-19
Portable Wood Ladders	WS.40.1 through WS.40.14	41-23
Portable Metal Ladders	WS.50.1 through WS.50.16	41-27
Fixed Ladders	WS.60.1 through WS.60.27	41-31



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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>WS.10 GENERAL REQUIREMENTS</b></p> <p><b>WS.10.1.</b> Places of employment, passageways, storerooms, and service rooms must be kept clean and orderly and in a sanitary condition (29 CFR 1910.22(a)(1)).</p> <p><b>WS.10.2.</b> Workroom floors must be maintained in a clean and, so far as possible, a dry condition (29 CFR 1910.22(a)(2)).</p> <p><b>WS.10.3.</b> Floors, working places, and passageways must be kept free from protruding nails, splinters, holes, and loose boards (29 CFR 1910.22(a)(3)).</p> <p><b>WS.10.4.</b> Safe clearance must be allowed for mechanical handling equipment (29 CFR 1910.22(b)(1)).</p> <p><b>WS.10.5.</b> Permanent aisles and passageways must be appropriately marked (29 CFR 1910.22(b)(2)).</p>	<p>(NOTE: 29 CFR 1910.22 (see the checklist items in WS.10) does not apply to installations where domestic, mining, or agricultural work is performed.)</p> <p>(NOTE: Measures for the control of toxic materials are considered to be outside the scope of 29 CFR 1910.22.)</p> <p>Verify that places of employment, passageways, storerooms, and service rooms are kept clean and orderly and in a sanitary condition.</p> <p>Verify workroom floors are maintained in a clean and, so far as possible, a dry condition.</p> <p>Verify that, where wet processes are used, drainage is maintained.</p> <p>Verify that, where wet processes are used, dry standing places such as false floors, platforms, or mats are provided.</p> <p>Verify that every floor, working place, and passageway is free from protruding nails, splinters, holes, and loose boards.</p> <p>Verify that, where mechanical handling equipment is used, there is sufficient safe clearance in aisles, at loading docks, through doorways, and wherever turns or passage must be made.</p> <p>Verify that aisles and passageways are kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.</p> <p>Verify that permanent aisles and passageways are appropriately marked.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>WS.10.6.</b> Installations must provide covers and/ or guardrails to protect personnel from the hazards of open tanks, vats, ditches, etc. (29 CFR 1910.22(c)).	Verify that covers and/or guardrails protect are provided to protect personnel from the hazards of open tanks, vats, ditches, etc.
<b>WS.10.7.</b> Approved loads for roofs and floors must meet be posted in accordance with certain requirements (29 CFR 1910.22(d)(1) and 1910.22(d)(2)).	Verify that the owner of a building or other structure used for mercantile, business, industrial, or storage purposes, or the owner's authorized agent supplies plates of approved design marked with the load approved by the building official.  Verify that the owner or the owner's authorized agent affixes the plates marked with the approved load conspicuously in each space to which they relate.  Verify that the owner or the owner's agent replaces lost, removed, or defaced plates.
<b>WS.10.7.</b> Installations must not place or cause or permit the placement of a load greater than the approved load on the roof of a building or other structure (29 CFR 1910.22(d)(2)).	Verify that no load greater than the approved load is placed on the roof or floor of a building or other structure.

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<p><b>WS.20</b>  <b>GUARDING FLOOR AND WALL OPENINGS AND HOLES</b></p> <p><b>WS.20.1.</b> Railing guard-ing stairway floor openings must meet certain requirements (29 CFR 1910.23(a)(1)).</p> <p><b>WS.20.2.</b> Ladderway floor openings or platforms must be guarded by railings that meet certain requirements (29 CFR 1910.23(a)(2)).</p> <p><b>WS.20.3.</b> Hatchways and chute floor openings must be guarded by hinged floor covers or railings that meet certain requirements (29 CFR 1910.23(a)(3)(i) and 1910.23(a)(3)(ii)).</p>	<p>Verify that stairway floor openings are guarded by a standard railing that meets the requirements of 29 CFR 1910.23(e) (see checklist items WS.20.20 through WS.20.37).</p> <p>Verify that railings guarding stairway floor openings are provided on all exposed sides (except at entrance to stairway).</p> <p>Verify that the guard protecting infrequently used stairways where traffic across the opening prevents the use of fixed standard railing, consists of both:</p> <ul style="list-style-type: none"> <li>- a hinged floor opening cover of standard strength and construction</li> <li>- removable standard railings on all exposed sides (except at entrance to stairway).</li> </ul> <p>Verify that ladderway floor openings or platforms are guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening).</p> <p>Verify that passage through the railing is either provided by a swinging gate or is so offset that a person cannot walk directly into the opening.</p> <p>Verify that every hatchway and chute floor opening is guarded by one of the following:</p> <ul style="list-style-type: none"> <li>- a hinged floor opening cover</li> <li>- a removable railing.</li> </ul> <p>Verify that hinged floor opening covers guarding hatchways and chute floor openings:</p> <ul style="list-style-type: none"> <li>- are of standard strength and construction</li> <li>- are equipped with or permanently attached to standard railings that leave only one exposed side.</li> </ul> <p>Verify that, when the opening is not in use, hinged floor openings are closed or the exposed sided guarded at both top and intermediate positions by removable standard railings.</p>

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<p><b>WS.20.4.</b> Skylight floor openings and holes must be guarded by a standard skylight screen or a fixed standard railing on all exposed sides (29 CFR 1910.23(a)(4)).</p> <p><b>WS.20.5.</b> Infrequently used pit and trapdoor floor openings must be guarded in accordance with certain requirements (29 CFR 1910.23(a)(5)).</p> <p><b>WS.20.6.</b> Manhole floor openings must be guarded in accordance with certain requirements (29 CFR 1910.23(a)(6)).</p> <p><b>WS.20.7.</b> Temporary floor openings must have standard railing or be constantly attended by someone (29 CFR 1910.23(a)(7)).</p> <p><b>WS.20.8.</b> Floor holes into which someone might accidentally walk must be guarded by a standard railing with toeboard or a floor hole cover (29 CFR 1910.23(a)(8)(i) and (29 CFR 1910.23(a)(8)(ii)).</p>	<p>Verify that railing guarding hatchways and chute floor openings consists of both:</p> <ul style="list-style-type: none"> <li>- removable railing with toeboard on not more than two sides of the opening</li> <li>- fixed standard railing with toeboards on all other exposed sides</li> </ul> <p>Verify that, when the opening is not in use, the removable railing is kept in place.</p> <p>Verify that, when material is fed into any hatchway or chute opening, protection is provided to prevent personnel from falling through the opening.</p> <p>Verify that skylight floor openings and holes are guarded either by a standard skylight screen or a fixed standard railing on all exposed sides.</p> <p>Verify that infrequently used pit and trapdoor floor openings are guarded by a floor opening cover of standard strength and construction.</p> <p>Verify that while the floor opening cover is not in place, the pit or trap opening is protected on all exposed sides by removable standard railing or is constantly attended.</p> <p>Verify that manhole floor openings are guarded by a standard manhole cover.</p> <p>(NOTE: The manhole cover need not be hinged in place.)</p> <p>Verify that, while the manhole cover is not in place, the manhole opening is protected by removable standard railing or is constantly attended by someone.</p> <p>Verify that temporary floor openings have standard railings or are constantly attended.</p> <p>Verify that floor holes into which someone might accidentally walk are guarded by one of the following:</p> <ul style="list-style-type: none"> <li>- a standard railing with standard toeboard on all exposed sides</li> <li>- a floor hole cover of standard strength and construction.</li> </ul> <p>Verify that, while the floor hole cover is not in place, the hole is protected by a removable standard railing or is constantly attended by someone.</p>

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<p><b>WS.20.9.</b> Floor holes into which someone cannot accidentally walk must be protected by a secure cover that leaves no openings more than 1-in. wide (29 CFR 1910.23(a)(9)).</p> <p><b>WS.20.10.</b> Doors or gates that open directly on a stairway must have platforms that meet certain requirements (29 CFR 1910.23(a)(10)).</p> <p><b>WS.20.11.</b> Wall openings from which there is a drop of more than 4 ft must be guarded in accordance with certain requirements (29 CFR 1910.23(b)(1)(i)).</p>	<p>Verify that every floor hole into which someone cannot accidentally walk, on account of fixed machinery, equipment, or walls, is protected by a cover that leaves no openings more than 1 in. wide.</p> <p>Verify that the floor coverings are securely held in place to prevent tools or materials from falling through.</p> <p>Verify that a platform provided where doors and gates open directly on a stairway.</p> <p>Verify that the swing of the door or gate does not reduce the effective width of the platform to less than 20 in.</p> <p>Verify that wall openings from which there is a drop of more than 4 ft are guarded by one of the following:</p> <ul style="list-style-type: none"> <li>- rail</li> <li>- roller</li> <li>- picket fence</li> <li>- half door</li> <li>- extension platform</li> <li>- some equivalent barrier.</li> </ul> <p>Verify that, where there is exposure to falling materials, a removable toe board or the equivalent is provided.</p> <p>Verify that, when the opening is not in use for handling materials, the guard is kept in position.</p> <p>Verify that a grab handle of standard strength and mounting is provided on each side of the opening with its center approximately 4 ft above floor level.</p> <p>Verify that, if an extension platform is used to guard the wall opening, materials can be hoisted onto it for handling.</p> <p>Verify that, if an extension platform is used to guard the wall opening, it has side rails or equivalent guards of standard specifications.</p>
<p><b>WS.20.12.</b> Chute wall openings from which there is a drop of more than 4 ft must be guarded in accordance with certain requirements (29 CFR 1910.23(b)(2)).</p>	<p>Verify that chute wall openings from which there is a drop of more than 4 ft are guarded by one or more of the following barriers:</p> <ul style="list-style-type: none"> <li>- a standard railing with standard toeboard on all exposed sides</li> <li>- a floor hole cover of standard strength and construction</li> <li>- some other barrier as required by the conditions.</li> </ul>

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<p><b>WS.20.13.</b> Wall windows opening at a stairway, landing, floor, platform, or balcony, from which there is a drop of more than 4 ft, and where the bottom of the opening is less than 3 ft above the platform or landing must be guarded in accordance with certain requirements (29 CFR 1910.23(b)(3)).</p>	<p>Verify that wall windows opening at a stairway, landing, floor, platform, or balcony, from which there is a drop of more than 4 ft, and where the bottom of the opening is less than 3 ft above the platform or landing, are guarded by one of the following:</p> <ul style="list-style-type: none"> <li>- standard slats</li> <li>- grillwork with openings of not more than 8-in. long</li> <li>- standard railing.</li> </ul> <p>Verify that, where the window opening is below the landing or platform, a standard toe board is provided.</p>
<p><b>WS.20.14.</b> Temporary wall openings must have adequate guards (29 CFR 1910.23(b)(4)).</p>	<p>Verify that temporary wall openings have adequate guards.</p> <p>(NOTE: These guards need not be of standard construction.)</p>
<p><b>WS.20.15.</b> When there is a hazard of materials falling through a wall holes, the hole must be protected in accordance with certain requirements (29 CFR 1910.23(b)(5)).</p>	<p>Determine whether there is a hazard of materials falling through a wall hole, and whether the lower edge of the near side of a wall hole is less than 4 in. above the floor, and the far side of the hole is more than 5 ft above the next lower level.</p> <p>Verify that such holes are protected by either:</p> <ul style="list-style-type: none"> <li>- a standard toeboard</li> <li>- an enclosing screen of solid construction</li> <li>- an enclosing screen of grillwork with openings of not more than 8-in. long</li> <li>- an enclosing screen of slatwork with openings not more than 4-in. wide with length unrestricted.</li> </ul>
<p><b>WS.20.16.</b> Open-sided floors or platforms 4 ft or more above adjacent floor or ground level must be guarded in accordance with certain requirements (29 CFR 1910.23(c)(1)).</p>	<p>Verify that open-sided floors or platforms 4 ft or more above adjacent floor or ground level are guarded by standard railing (or the equivalent as specified in 29 CFR 1910.23(e)(3) (see checklist items WS.20.22 through WS.20.24).</p> <p>Verify that the railing guarding such a drop is placed on all open sides except where there is entrance to a ramp, stairway, or fixed ladder.</p> <p>Verify that the railing guarding such a drop is provided with a toeboard wherever, beneath the open sides:</p> <ul style="list-style-type: none"> <li>- persons can pass</li> <li>- there is moving machinery</li> <li>- there is equipment with which falling materials could create a hazard.</li> </ul>
<p><b>WS.20.17.</b> Runways 4 ft or more above floor or ground level must have guardrailings and toe-boards that meet cer-</p>	<p>Verify that runways 4 ft or more above floor or ground level are guarded by standard railing (or the equivalent as specified in 29 CFR 1910.23(e)(3) (see checklist items WS.20.22 through WS.20.24).</p>

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<p>tain requirements (29 CFR 1910.23(c)(2)).</p> <p><b>WS.20.18.</b> Open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, or similar hazards must be guarded with a standard rail and toeboard (29 CFR 1910.23(c)(3)).</p> <p><b>WS.20.19.</b> Every flight of stairs having 4 or more risers must be equipped with stair railings or handrails that meet certain specifications (29 CFR 1910.23(d)(1)(i) through 1910.23(d)(1)(v), and 1910.23(d)(2)).</p>	<p>Verify that, wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard is provided on each exposed side.</p> <p>(NOTE: Additional guarding may be essential for protection on runways that expose personnel to machinery, electrical equipment, or other dangers not associated with falling hazards.)</p> <p>(NOTE: runways used exclusively for special purposes such as oiling, shafting, or filling tank cars may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway not less than 18 in wide.)</p> <p>Verify that open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, or similar hazards are guarded by a standard rail and toeboard.</p> <p>(NOTE: This requirement applies regardless of the height of the floors, walkways, platform, or runways.)</p> <p>(NOTE: The width of the stair is to be measured clear of all obstructions except handrails.)</p> <p>Verify that flights of stairs less than 44 in. width, with four or more risers, and both sides enclosed, have at least one handrail, preferably on the right side descending.</p> <p>Verify that flights of stairs less than 44 in. in width, with four or more risers, and one side open, have at least one stair railing on the open side.</p> <p>Verify that flights of stairs less than 44 in. in width, with four or more risers, and both sides open, have one stair railing on each side.</p> <p>Verify that flights of stairs between 44 in. and 88 in. in width and with four or more risers have:</p> <ul style="list-style-type: none"> <li>- one handrail on each enclosed side</li> <li>- one stair railing on each open side.</li> </ul> <p>Verify that flights of stairs with four or more risers and more than 88-in. wide, have:</p> <ul style="list-style-type: none"> <li>- one handrail on each enclosed side</li> <li>- one stair railing on each open side</li> <li>- one intermediate stair railing located approximately midway of the width.</li> </ul>

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<p><b>WS.20.20.</b> Standard railing must meet certain requirements (29 CFR 1910.23(e)(1)).</p> <p><b>WS.20.21.</b> Stair railing must meet certain requirements (29 CFR 1910.23(e)(2)).</p> <p><b>WS.20.22.</b> Wood railing must meet certain requirements (29 CFR 1910.23(e)(3)(i)).</p> <p><b>WS.20.23.</b> Pipe railing must be at least 1.5 in. nominal diameter with posts spaced not more than 8 ft on centers (CFR 1910.23(e)(3)(ii)).</p>	<p>Verify that winding stairs are equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 in.</p> <p>Verify that a standard railing consists of top rail, intermediate rail, and posts.</p> <p>Verify that standard railing has a vertical height of 42 in. nominal from upper surface of top rail to floor, platform, runway, or ramp level.</p> <p>Verify that the top rail of standard railing is smooth-surfaced throughout its length.</p> <p>Verify that the intermediate rail of standard railing is approximately halfway between the top rail and the floor, platform, runway, or ramp.</p> <p>Verify that the ends of rails of standard railing do not overhang the terminal posts, except where the overhang does not constitute a projection hazard.</p> <p>Verify that stair railing consists of top rail, intermediate rail, and posts.</p> <p>Verify that stair railing has a vertical height not more than 34 in. nor less than 30 in. from the upper surface of the top rail to the surface of tread in line with the face of the riser at the forward edge of tread.</p> <p>Verify that the top rail of stair railing is smooth-surfaced throughout its length.</p> <p>Verify that the intermediate rail of stair railing is approximately halfway between the top rail and the floor, platform, runway, or ramp.</p> <p>Verify that the ends of rails of stair railing do not overhang the terminal posts, except where the overhang does not constitute a projection hazard.</p> <p>Verify that, for wood railing, posts are of at least 2 in. by 4 in. stock spaced, but do not exceed 6 ft.</p> <p>Verify that, for wood railing, top and intermediate rails are of at least 2 in. by 4 in. stock.</p> <p>(NOTE: If the top rail is made of two right angle pieces of 1 in. by 4 in. stock, posts may be spaced on 8 ft centers, with 2 in. by 4 in. intermediate railing.)</p> <p>Verify that, for pipe railing, posts and top and intermediate railing are at least 1.5-in. nominal diameter.</p> <p>Verify that, for pipe railing, posts are spaced not more than 8 ft on centers.</p>

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<b>WS.20.24.</b> Structural steel railings must meet certain construction standards (29 CFR 1910.23(e)(3)(iii)).	Verify that, for structural steel railing, posts and top and intermediate rails are of 2 in. by 2 in. by 3/8 in. angles, or other metal shapes of equivalent bending strength with posts spaced not more than 8 ft on centers.
<b>WS.20.25.</b> Standard toeboards must meet certain requirements (29 CFR 1910.23(e)(4)).	<p>Verify that, for a standard toeboard,</p> <ul style="list-style-type: none"> <li>- the vertical height is 4 in. nominal from its top edge to the level of the floor, platform, runway, or ramp</li> <li>- it is securely fastened in place</li> <li>- there is not more than 1/4 in. clearance above floor level</li> </ul> <p>(NOTE: A standard toeboard may be made of any substantial material, either solid or with openings not over 1 in. in greatest diameter.</p> <p>Verify that, where material is piled to such a height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail is provided.</p>
<b>WS.20.26.</b> Handrails must be constructed to meet certain requirements (29 CFR 1910.23(e)(5)(i)).	<p>Verify that handrails consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the handrail's lower side so as to offer a smooth surface along the top and both sides of handrails.</p> <p>Verify that handrails are either rounded or of some other shape that will furnish an adequate handhold for anyone grasping it to avoid falling.</p> <p>Verify that the ends of handrails are turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.</p>
<b>WS.20.27.</b> Handrails must be not more than 34 in. nor less than 30 in. from the upper surface of handrails to the surface of the tread in line with the face of the riser or to the surface of the ramp (29 CFR 1910.23(e)(5)(ii)).	Verify that the height from the upper surface of handrails to the surface of the tread in line with the face of the riser or to the surface of the ramp is neither more than 34 in. nor less than 30 in.
<b>WS.20.28.</b> Handrails must be at least 2 in. in diameter when of hard-wood and at least 1.5 in. in diameter if made of metal pipe (29 CFR 1910.23(e)(5)(iii)).	<p>Verify that the size of the handrail is:</p> <ul style="list-style-type: none"> <li>- at least 2 in. in diameter if made of hardwood</li> <li>- at least 1.5 in. in diameter if made of metal pipe.</li> </ul>

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<b>WS.20.29.</b> The brackets of handrails must be of such a length that there is at least a 3 in. clearance between the handrail and wall, or any projection thereon and spaced at a maximum of 8 ft (29 CFR 1910.23(e)(5)(iii)).	Verify that brackets on a handrail are: <ul style="list-style-type: none"> <li>- of such a length that there is at least a 3 in. clearance between a handrail and wall, or any projection thereon</li> <li>- spaced at a maximum of 8 ft.</li> </ul>
<b>WS.20.30.</b> All handrails and railings must have a clearance between the rail and any other object of not less than 3 in. (29 CFR 1910.23(e)(6)). *	Verify that handrails and railings have a clearance between the rail and any other object of not less than 3 in.
<b>WS.20.31.</b> Trench or conduit covers and their supports, when located in plant roadways, must be designed to carry a truck rear-axle load of at least 20,000 lb (29 CFR 1910.23(e)(7)(i)).	Verify that trench or conduit covers and their supports, when located in plant roadways, are designed to carry a truck rear-axle load of at least 20,000 lb.  (NOTE: Trench or conduit covers may be constructed of any material that meets these strength requirements.)
<b>WS.20.32.</b> Manhole covers and their supports, when located in plant roadways, must comply with local standard highway requirements (if any), otherwise they must carry a truck rear-axle load of at least 20,000 lb (29 CFR 1910.23(e)(7)(ii)).	Determine whether there are local standard highway requirements for manhole covers and their supports.  Verify that manhole covers and their supports, when located in plant roadways, comply with local standard highway requirements, if any.  Verify that manhole covers and their supports, if there are no local standard highway requirements, are designed to carry a truck rear-axle load of at least 20,000 lb.  (NOTE: Manhole covers may be constructed of any material that meets these strength requirements.)
<b>WS.20.33.</b> Hinges, handles, bolts, or other parts of floor opening covers must be set flush with the floor or cover surface (29 CFR 1910.23(e)(7)(iii)).	Verify that hinges, handles, bolts, or other parts of floor opening covers are set flush with the floor or cover surface.  (NOTE: Covers projecting not more than 1 in. above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30 degrees.)

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<p><b>WS.20.34.</b> Skylight screens must be constructed and mounted such that they meet certain requirements (29 CFR 1910.23(e)(8)).</p>	<p>Verify that skylight screens are of such construction and mounting that they can withstand a load of at least 200 lb applied perpendicularly at any one area on the screen.</p> <p>Verify that skylight screens are of such construction that, under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them.</p> <p>Verify that the construction is of grillwork with openings not more than 4 in. long or of slatwork with openings not more than 2-in. wide with length unrestricted.</p>
<p><b>WS.20.35.</b> Wall opening barriers must be constructed and mounted in accordance with specific requirements (29 CFR 1910.23(e)(9)).</p>	<p>Verify that wall opening barriers (rails, rollers, picket fences, and half doors) are of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 lb applied in any direction (except upward) at any point on the top rail or corresponding member.</p>
<p><b>WS.20.36.</b> Wall opening grab handles must meet certain requirements (29 CFR 1910.23(e)(10)).</p>	<p>Verify that wall opening grab handles are:</p> <ul style="list-style-type: none"> <li>- not less than 12 in. in length</li> <li>- mounted so as to give 3 in. clearance from the side framing of the wall opening</li> </ul> <p>Verify that the size, material, and anchoring of the grab handle is such that the completed structure is capable of withstanding a load at least 200 lb applied in any direction at any point on the handle.</p>
<p><b>WS.20.37.</b> Wall opening screens must meet construction and mounting requirements (29 CFR 1910.23(e)(11)).</p>	<p>Verify that wall opening screens are of such construction and mounting that they are capable of withstanding a load of at least 200 lb applied horizontally at any point on the near side of the screen.</p> <p>(NOTE: Wall opening screens may be of solid construction, of grillwork with openings of not more than 8 in. long, or slatwork with openings not more than 4 in. wide with length unrestricted.)</p>



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<p><b>WS.30</b>  <b>FIXED INDUSTRIAL STAIRS</b></p> <p><b>WS.30.1.</b> Fixed stairs must be provided for access to certain areas which are routinely used (29 CFR 1910.24(b)).</p> <p><b>WS.30.2.</b> Spiral stairways are not permitted (29 CFR 1910.24(b)).</p>	<p>(NOTE: The requirements in WS.30 contain specifications for the safe design and construction of fixed general industrial stairs, which includes the following:</p> <ul style="list-style-type: none"> <li>- interior and exterior stairs around machinery, tanks, and other equipment,</li> <li>- stairs leading to or from floors, platforms, or pits.)</li> </ul> <p>(NOTE: These requirements do not apply to:</p> <ul style="list-style-type: none"> <li>- stairs used for fire exit purposes</li> <li>- construction operations to private residences</li> <li>- articulated stairs, such as may be installed on floating roof tanks or on dock facilities, the angle of which changes with the rise and fall of the base support.)</li> </ul> <p>Verify that fixed stairs are provided for access from one structure level to another where operations necessitate regular travel between the levels.</p> <p>Verify that fixed stairs are provided for access to operating platforms at any equipment which requires attention routinely during operations.</p> <p>Verify that fixed stairs are provided where access to elevations is daily or at each shift, for such purposes as gauging, inspection, regular maintenance, etc., and</p> <ul style="list-style-type: none"> <li>- personnel may be exposed to acids, caustics, gases, or other harmful substances, or</li> <li>- for which purposes the carrying of tools or equipment by hand is normally required.</li> </ul> <p>(NOTE: These requirements are no intended to preclude the use of fixed ladders for access to elevated tanks, towers, and similar structures, overhead traveling cranes, etc., where the use of fixed ladders is common practice.)</p> <p>Verify that spiral stairways are not used.</p> <p>(NOTE: This requirement does not preclude use of spiral stairs for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.)</p> <p>(NOTE: Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than 5 ft.)</p>

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<b>WS.30.3.</b> Fixed stairways must be designed and constructed to carry a load five times the normal anticipated live load (29 CFR 1910.24(c)).	Verify that fixed stairways are designed and constructed to carry a load of five times the normal anticipated live load.  Verify that fixed stairways are never of less strength than to carry safely a moving concentrated load of 1,000 lb.
<b>WS.30.4.</b> Fixed stairways must have a minimum width of 22 in. (29 CFR 1910.24(d)).	Verify that fixed stairways have a minimum width of 22 in.
<b>WS.30.5.</b> Fixed stairways must be installed at angles to the horizontal of between 30 and 50 degrees (29 CFR 1910.24(e)).	Verify that fixed stairs are installed at angles to the horizontal of between 30 and 50 degrees.  (NOTE: Any uniform combination of rise/tread dimensions may be used that will result in a stairway at an angle to the horizontal within the permissible range. 29 CFR 1910.24, Table D-1 contains examples of rise/tread dimensions that will produce a stairway within the permissible range.)
<b>WS.30.6.</b> All stair treads must be reasonably slip-resistant (29 CFR 1910.24(f)).	Verify that stair treads are reasonably slip-resistant.  Verify that the nosings of stair treads are of nonslip finish.  (NOTE: Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design.)  Verify that rise height and tread width are uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.
<b>WS.30.7.</b> Stairway platforms must be no less than the width of a stairway and a minimum of 30 in. in length measured in the direction of travel (29 CFR 1910.24(g)).	Verify that stairway platforms are no less than the width of a stairway and a minimum of 30 in. in length measured in the direction of travel.
<b>WS.30.8.</b> Railings and handrails must be provided and installed on fixed stairways in accordance with certain requirements (29 CFR 1910.24(h)).	Verify that standard railings are provided on the open sides of all exposed stairways and stair platforms.  Verify that handrails are provided on a least one side of closed stairways, preferably on the right side descending.  Verify that stair railings and handrails are installed in accordance with the provisions of 29 CFR 1910.23 (see the checklist items in WS.20).

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<b>WS.30.9.</b> Vertical clearance above any stair tread to an overhead obstruction must be at least 7 ft measured from the leading edge of the tread (29 CFR 1910.24(i)).	Verify that vertical clearance above any stair tread to an overhead obstruction is at least 7 ft measured from the leading edge of the tread.



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<p align="center"><b>REGULATORY REQUIREMENTS:</b></p>	<p align="center"><b>REVIEWER CHECKS:</b>  <b>September 1997</b></p>
<p><b>WS.40</b>  <b>PORTABLE WOOD LADDERS</b></p>	<p>(NOTE: The requirements in WS.40 are intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage.)</p> <p>(NOTE: Stepladders are one of the three following types:</p> <ul style="list-style-type: none"> <li>- Type I-Industrial Stepladder, 3 to 20 ft for heavy duty, such as utilities, contractors, and industrial use.</li> <li>- Type II-Commercial Stepladder, 3 to 12 ft for medium duty such as painters, offices, and light industrial use.</li> <li>- Type III-Household Stepladder, 3 to 6 ft for light duty, such as light household use.</li> </ul> <p>(NOTE: The following types of ladders are not specifically covered by WS.40:</p> <ul style="list-style-type: none"> <li>- other types of special ladders</li> <li>- fruitpicker's ladders</li> <li>- combination step and extension ladders</li> <li>- stockroom stepladders</li> <li>- aisle-way step ladders</li> <li>- shelf ladders</li> <li>- library ladders.)</li> </ul>
<p><b>WS.40.1.</b> Wood parts must meet certain requirements (29 CFR 1910.25(b)(1)(i)).</p>	<p>Verify that wood parts are free from sharp edges and splinters.</p> <p>Verify that wood parts are sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities.</p>
<p><b>WS.40.2.</b> Low density wood must not be used (29 CFR 1910.25(b)(1)(i)).</p>	<p>Verify that low density wood is not used.</p>
<p><b>WS.40.3.</b> Portable stepladders longer than 20 ft must not be supplied (29 CFR 1910.25(c)(2)).</p>	<p>Verify that portable stepladders longer than 20 ft are not supplied.</p>
<p><b>WS.40.4.</b> Portable wood ladders must use uniform step spacing (29 CFR 1910.25(c)(2)(i)(b)).</p>	<p>Verify that portable wood ladders use uniform step spacing which is not more than 12 in.</p> <p>Verify that steps are parallel and level when the ladder is in position for use.</p>

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<b>WS.40.5.</b> Portable wood ladders must conform to minimum width requirements (29 CFR 1910.25(c)(2)(i)(c)).	Verify that the minimum width between side rails at the top, inside to inside, is not less than 11.5 in.  Verify that, from top to bottom, the side rails are spread at least 1 in. for each foot of length of the stepladder.
<b>WS.40.6.</b> Portable wood ladders must have a metal spreader or locking device (29 CFR 1910.25 (c)(2)(i)(f)).	Verify that portable wood ladders have a metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions.  Verify that the spreader has all sharp points covered or removed to protect the user.  (NOTE: For Type III ladders, the pail shelf and spreader may be combined in one unit (the so-called shelf-lock ladder.))
<b>WS.40.7.</b> Portable rung ladders must conform to certain construction requirements (29 CFR 1910.25(c)(2) through 1910.25(c)(5)).	Verify that single ladders longer than 30 ft are not supplied.  Verify that two-section extension ladders longer than 60 ft are not supplied.  Verify that all two-section extension ladders consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered.  Verify that assembled combinations of sectional ladders do not exceed the lengths specified in this checklist item.  Verify that trestle ladders, extension sections of extension trestle ladders, or base sections of extension trestle ladders longer than 20 ft are not supplied.
<b>WS.40.8.</b> Special purpose ladders must not exceed certain lengths (29 CFR 1910.25(c)(4)).	Verify that painter's stepladders longer than 12 ft are not supplied.  Verify that mason's ladders longer than 40 ft are not supplied.  (NOTE: A mason's ladder is a special type of single ladder intended for use in heavy construction work.)
<b>WS.40.9.</b> Trolley and side-rolling ladders must not exceed certain lengths (29 CFR 1910.25(c)(5)).	Verify that trolley ladders longer than 20 ft are not supplied.  Verify that side-rolling ladders longer than 20 ft are not supplied.
<b>WS.40.10.</b> Ladders must be inspected frequently (29 CFR 1910.25(d)(1)(x)).	Verify that ladders are inspected frequently.

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<p><b>WS.40.11.</b> Defective ladders must be withdrawn from service for repair or destruction and marked as dangerous (29 CFR 1910.25(d)(1)(x)).</p>	<p>Verify that ladders which have developed defects are withdrawn from service for repair or destruction and tagged or marked as DANGEROUS, DO NOT USE.</p>
<p><b>WS.40.12.</b> Ladders must be maintained in good condition at all times to insure safety and serviceability (29 CFR 1910.25(d)(1)(i) through 1910.25(d)(1)(iv) and 1910.25(d)(1)(xi)).</p>	<p>Verify that ladders are maintained in good condition at all times.</p> <p>Verify that the joint between the steps and side rails is tight and that all hardware and fittings are securely attached.</p> <p>Verify that the movable parts operate freely without binding or undue play.</p> <p>Verify that metal bearings of locks, wheels, pulleys, etc., are frequently lubricated.</p> <p>Verify that frayed or badly worn rope is replaced.</p> <p>Verify that safety feet and other auxiliary equipment are kept in good condition to insure proper performance.</p> <p>Verify that rungs are kept free of grease and oil.</p>
<p><b>WS.40.13.</b> Certain safety precautions must be observed in connection with the use of ladders (29 CFR 1910.25(d)(2)(i) through (v), 29 CFR 1910.25(d)(2)(viii) through (xii), and 29 CFR 1910.25(d)(2)(xiv), (xv), (xvii), (xix), and (xx)).</p>	<p>Verify that portable rung and cleat ladders are, where possible, used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder.</p> <p>(NOTE: The working length is the length along the ladder between the foot and the top support.)</p> <p>Verify that the ladder is either placed so as to prevent slipping, lashed in place, or held in place.</p> <p>Verify that ladders are not used in a horizontal position as platforms, runways, or scaffolds.</p> <p>Verify that ladders for which dimensions are specified are not used by more than one man at a time nor with ladder jacks and scaffold planks where use by more than one man is anticipated.</p> <p>(NOTE: In such cases, specially designed ladders with larger dimensions of the parts should be procured.)</p> <p>Verify that portable ladders are so placed that the side rails have a secure footing.</p> <p>Verify that the top rest of portable rung and cleat ladders is reasonably rigid and has ample strength to support the applied load.</p>

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<p><b>WS.40.14.</b> On two-section extension ladders the minimum overlap for the two sections in use must meet certain requirements (29 CFR 1910.25 (d)(2)(xiii)).</p>	<p>Verify that ladders are not placed in front of doors opening toward the ladder unless the door is blocked upon, locked, or guarded.</p> <p>Verify that ladders are not placed on boxes, barrels, or other unstable bases to obtain additional height.</p> <p>Verify that ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment are not used.</p> <p>Verify that improvised repairs are not made to ladders.</p> <p>Verify that short ladders are not spliced together to provide long sections.</p> <p>Verify that ladders made by fastening cleats across a single rail are not used.</p> <p>Verify that ladders are not used as guys, braces, or skids, or for other than their intended purposes.</p> <p>Verify that tops of the ordinary types of stepladders are not used as steps.</p> <p>Verify that portable rung ladders with reinforced rails are used only with the metal reinforcement on the underside.</p> <p>Verify that no ladder is used to gain access to a roof unless the top of the ladder extends at least 3 ft above the point of support, at eave, gutter, or roofline.</p> <p>(NOTE: Middle or top sections of sectional or window cleaner's ladders should not be used as bottom section unless the user equips them with safety shoes.)</p> <p>(Note: The user should equip all portable rung ladders with nonslip bases when there is a hazard of slipping. Non-slip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, or slippery surfaces.)</p> <p>(NOTE: The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing).</p> <p>Verify that, on two-section extension ladders, the minimum overlap for the two section in use is in accordance with the following:</p> <ul style="list-style-type: none"> <li>- a minimum overlap of 3 ft for ladders up to and including 36 ft</li> <li>- a minimum overlap of 4 ft for ladders over 36 ft, up to and including 48 ft</li> <li>- a minimum overlap of 5 ft for ladders over 48 ft, up to and including 60 ft.</li> </ul>

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<p><b>WS.50</b>  <b>PORTABLE METAL LADDERS</b></p> <p><b>WS.50.1.</b> Portable metal ladders must meet certain general design requirements (29 CFR 1910.26(a)(1)).</p> <p><b>WS.50.2.</b> The spacing of rungs or steps must meet certain requirements (29 CFR 1910.26(a)(1)(iii)) and 1910.26(a)(1)(v)).</p> <p><b>WS.50.3.</b> The minimum width between side rails of a straight ladder or any section of an extension ladder must be 12 in. (29 CFR 1910.26(a)(2)(i)).</p> <p><b>WS.50.4.</b> The lengths of single ladders and extension ladders must not exceed certain specifications (29 CFR 1910.26(a)(2)(ii)).</p> <p><b>WS.50.5.</b> Each section of a multisection ladder must overlap the adjacent section in accordance with certain requirements (29 CFR 1910.26(a)(2)(iii) and (iv)).</p>	<p>(NOTE: Specific design and construction requirements are not part of WS.50.)</p> <p>Verify that the design is such as to produce a ladder without structural defects or accident hazards such as sharp edges, burrs, etc.</p> <p>Verify that the metal selected is of sufficient strength to meet the test requirements.</p> <p>Verify that the metal is protected against corrosion, unless inherently corrosion-resistant.</p> <p>Verify that the spacing of rungs or steps is on 12-in. centers.</p> <p>Verify that rungs and steps are corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.</p> <p>Verify that the minimum width between side rails of a straight ladder or any section of an extension ladder is 12 in.</p> <p>Verify that the length of single ladders or individual sections of ladders does not exceed 30 ft.</p> <p>Verify that two-section ladders do not exceed 48 ft in length.</p> <p>Verify that ladders of more than two sections do not exceed 60 ft in length.</p> <p>Verify that, based on the nominal length of the ladder, each section of a multisection ladder overlaps the adjacent section by at least:</p> <ul style="list-style-type: none"> <li>- 3 ft for ladders up to and including 36 ft</li> <li>- 4 ft for ladders over 36 ft, up to and including 48 ft</li> <li>- 5 ft for ladders over 48 ft, up to and including 60 ft.</li> </ul> <p>Verify that extension ladders are equipped with positive steps which will ensure the specified overlap.</p>

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<b>WS.50.6.</b> Stepladders must not exceed 20 ft in length (29 CFR 1910.26(a)(3)(iii)).	Verify that stepladders do not exceed 20 ft in length.  (NOTE: The length of a stepladder is measured by the length of the front rail.)  (NOTE: To be classified a standard length ladder, the measured length must be within plus or minus 1/2 in. of the specified length.)
<b>WS.50.7.</b> The bottoms of the four rails of a stepladder must be supplied with insulating nonslip material (29 CFR 1910.26(a)(3)(vii)).	Verify that the bottoms of the four rails of a stepladder are supplied with insulating nonslip material for the safety of the user.
<b>WS.50.8.</b> A metal spreader or locking device must be a component of a stepladder (29 CFR 1910.26(a)(3)(viii)).	Verify that a metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position is a component of each stepladder.  Verify that the spreader has all sharp points or edges covered or removed to protect the user.
<b>WS.50.9.</b> Trestle ladders and sections of extension trestle ladders must be not be more than 20 ft (29 CFR 1910.26(a)(4)(i)).	Verify that neither trestle ladders, extension sections of trestle ladders, nor base section of extension trestle ladders are more than 20 ft in length.
<b>WS.50.10.</b> The length of a platform ladder must not exceed 20 ft (29 CFR 1910.26(a)(5)(i)).	Verify that the length of platform ladders does not exceed 20 ft.  (NOTE: The length of a platform ladder is measured along the front rail from the floor to the platform.)
<b>WS.50.11.</b> Ladders must be maintained in good, usable condition at all times (29 CFR 1910.26(c)(1)).	Verify that ladders are maintained in good, usable condition at all times.
<b>WS.50.12.</b> Ladders must be immediately inspected in certain circumstances (29 CFR 1910.26(c)(2)(iv) and 1910.26(c)(2)(vi)(a)).	Determine whether the ladder has tipped over or been exposed to oil or grease.  Verify that, if ladders tip over, the ladder is inspected for the following:  - side rail dents or bends - excessively dented rungs - proper rung-to-side-rail connections - proper hardware connections - sheared rivets.

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<p><b>WS.50.13.</b> Defective ladders must be marked and taken out of service until repaired (29 CFR 1910.26(c)(2)(vii)).</p> <p><b>WS.50.14.</b> Ladders must be placed for use in accordance with certain requirements (29 CFR 1910.26(c)(3)(iii) and 1910.26(c)(3)(iv)).</p> <p><b>WS.50.15.</b> The climber must face ladder when ascending or descending (29 CFR 1910.26(c)(3)(v)).</p> <p><b>WS.50.16.</b> Ladder extensions must meet certain requirements (29 CFR 1910.26(c)(3)(vi)).</p>	<p>Verify that, if the ladder has been exposed to oil or grease, it is inspected immediately and cleaned of oil, grease, or slippery material.</p> <p>(NOTE: The cleaning can be accomplished easily using a solvent or steam cleaning.)</p> <p>Verify that defective ladders are marked and taken out of service until repaired by either the maintenance department or the manufacturer.</p> <p>Verify that the ladder base section is placed with a secure footing.</p> <p>Verify that the top of the ladder is placed with the two rails supported, unless equipped with a single support attachment.</p> <p>(NOTE: A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to 1/4 the working length of the ladder.)</p> <p>(NOTE: Portable ladders are designed as a one-man working ladder based on a 200-lb load.)</p> <p>Verify that, when ascending or descending, the climber faces the ladder.</p> <p>Verify that ladders are not tied or fastened together to provide longer sections.</p> <p>Verify that, if the manufacturer endorses extended uses, ladders are equipped with the hardware fittings necessary.</p> <p>Verify that ladders are not used as a brace, skid, guy or gin pole, gangway, or for other uses than that for which they were intended, unless specifically recommended for use by the manufacturer.</p> <p>(NOTE: See 29 CFR 1910.333(c) for work practices to be used when work is performed on or near electric circuits).</p>



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<p><b>WS.60</b>  <b>FIXED LADDERS</b></p> <p><b>WS.60.1.</b> All ladders must be maintained in a safe condition and inspected regularly (29 CFR 1910.27(f)).</p> <p><b>WS.60.2.</b> All ladders, appurtenances, and fastenings must be designed to meet certain load requirements (29 CFR 1910.27(a)(1)(i) through 1910.27(a)(1)(iv)).</p> <p><b>WS.60.3.</b> Wood components of ladders must meet certain requirements (29 CFR 1910.27(a)(2)).</p> <p><b>WS.60.4.</b> Rungs and cleats of fixed ladders must meet certain requirements (29 CFR 1910.27(b)(1)(i) through 1910.27(b)(1)(v)).</p>	<p>Verify that all ladders are maintained in a safe condition.</p> <p>Verify that all ladders are inspected regularly, with the intervals between inspections being determined by use and exposure.</p> <p>Verify that the minimum design live load is a single concentrated load of 200 lb.</p> <p>Verify that the number and position of additional concentrated live-load units of 200 lb each as determined from anticipated usage of the ladder is considered in the design.</p> <p>(NOTE: The live loads imposed by persons occupying the ladder is considered to be concentrated at such points as will cause the maximum stress in the structural member being considered.)</p> <p>Verify that the weight of the ladder and attached appurtenances together with the live load are considered in the design of rails and fastenings.</p> <p>Verify that design stresses for wood components of ladders do not exceed those specified in 29 CFR 1910.25 (Portable Wood Ladders) (see the checklist items in WS.40).</p> <p>Verify that all wood parts of fixed ladders are free from sharp edges and splinters.</p> <p>Verify that wood parts are sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities.</p> <p>Verify that low density wood is not be used.</p> <p>(NOTE: For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range 75 to 90 degrees, and intended for use by no more than one person per section, single ladders 30 ft or less in length are acceptable.)</p> <p>Determine whether metal ladders and appurtenances, or individual metal rungs are in an atmosphere that causes corrosion and rusting.</p> <p>Verify that, to increase rung life in such an atmosphere, individual metal rungs have a minimum diameter of 1 in. or are painted or otherwise treated to resist corrosion and rusting.</p>

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<p><b>WS.60.5.</b> Side rails which might be used as climbing aids must meet specific requirements (29 CFR 1910.27(b)(2)).</p> <p><b>WS.60.6.</b> Fastenings must be an integral part of fixed ladder design (29 CFR 1910.27(b)(3)).</p> <p><b>WS.60.7.</b> All splices must meet certain design requirements (29 CFR 1910.27(b)(4)).</p> <p><b>WS.60.8.</b> Adequate means must be employed to protect dissimilar metals from electrolytic action when such metals are joined (29 CFR 1910.27(b)(5)).</p> <p><b>WS.60.9.</b> Metal ladders must be protected from deterioration when in an atmosphere that causes corrosion and rusting (29 CFR</p>	<p>Verify that all metal rungs in other atmospheres have a minimum diameter of 3/4 in.</p> <p>Verify that all rungs for wood ladders have a minimum diameter of 1-1/8 in.</p> <p>Verify that the distance between rungs, cleats, and steps is uniform throughout the length of the ladder and does not exceed 12 in.</p> <p>Verify that the minimum clear length of rungs or cleats is 16 in.</p> <p>Verify that rungs, cleats, and steps are free of splinters, sharp edges, burrs, or projections which may be a hazard.</p> <p>Verify that the rungs of an individual-rung ladder are so designed that the foot cannot slide off the end.</p> <p>(NOTE: Figure D-1 of 29 CFR 1910.27 provides a suggested design.)</p> <p>Verify that side rails which might be used as climbing aids have a cross section that affords an adequate gripping surface.</p> <p>Verify that the gripping surface is without sharp edges, splinters, or burrs.</p> <p>Verify that fastenings are an integral part of fixed ladder design.</p> <p>Verify that all splices, made by whatever means, meet design requirements as noted in 29 CFR 1910.27(a) (see checklist items WS.60.2 and WS.60.3).</p> <p>Verify that all splices and connections have smooth transition with original members, with no sharp or extensive projections.</p> <p>Verify that adequate means are employed to protect dissimilar metals from electrolytic action when such metals are joined.</p> <p>Determine whether metal ladders and appurtenances, or individual metal rungs are in an atmosphere that causes corrosion and rusting.</p> <p>Verify that metal ladders and appurtenances are painted or otherwise treated to</p>

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<p>1910.27(b)(7)(i)).</p> <p><b>WS.60.10.</b> Wood ladders must be protected from deterioration when used under conditions where decay may occur (29 CFR 1910.27(b)(7)(ii)).</p> <p><b>WS.60.11.</b> When different types of materials are used in the construction of a ladder, the materials used must be so treated as to have no deleterious effect one upon the other (29 CFR 1910.27(b)(7)(iii)).</p> <p><b>WS.60.12.</b> Fixed ladders must be provided clearance on the climbing side that conforms with specific requirements (29 CFR 1910.27(c)(1)).</p> <p><b>WS.60.13.</b> Ladders without cages or wells must be provided a clear width that meets certain requirements (29 CFR 1910.27(c)(2)).</p> <p><b>WS.60.14.</b> Clearance in back of ladders must be pro-</p>	<p>resist corrosion and rusting when location demands.</p> <p>NOTE: Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting.)</p> <p>Verify that, to increase rung life in such an atmosphere, individual metal rungs have a minimum diameter of 1 in. or are painted or otherwise treated to resist corrosion and rusting.</p> <p>Determine whether wood ladders are being used under conditions where decay may occur.</p> <p>Verify that wood ladders used in such conditions are treated with a non-irritating preservative.</p> <p>Verify that the details are such as to prevent or minimize the accumulation of water on wood parts.</p> <p>Verify that, when different types of material are used in the construction of a ladder, the materials used are so treated as to have no effect one upon the other.</p> <p>Verify that on fixed ladders the perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder is as follows:</p> <ul style="list-style-type: none"> <li>- 36 in. for a pitch of 76 degrees</li> <li>- 30 in. for a pitch of 90 degrees, or</li> <li>- minimum clearance for intermediate pitches varying between these two limits in proportion to the slope.</li> </ul> <p>(NOTE: This requirement does not apply to ladders with cages or baskets or to fixed ladders on smooth-walled wells.)</p> <p>Verify that, in ladders without cages or wells, a clear width of at least 15 in. is provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary.</p> <p>Verify that the distance from the centerline of rungs, cleats, or steps to the near-</p>

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<p>vided (29 CFR 1910.27(c)(4)).</p> <p><b>WS.60.15.</b> Clearance must be provided in back of grab bars in accordance with certain requirements (29 CFR 1910.27(c)(5)).</p> <p><b>WS.60.16.</b> The step-across distance from ladder to closest equipment or structure must not be more than 12 in., nor less than 2.5 in. (29 CFR 1910.27(c)(6)).</p> <p><b>WS.60.17.</b> Hatch covers must be provided clearance in accordance with certain requirements (29 CFR 1910.27(c)(7)).</p> <p><b>WS.60.18.</b> Ladders with cages or wells must meet specific requirements (29 CFR 1910.27(d)(1)(i) through 1910.27(d)(1)(vi)).</p>		<p>est permanent object in back of the ladder is not less than 7 in.</p> <p>(NOTE: Figure D-3 of 29 CFR 1910.27 provides minimum clearances that must be provided if unavoidable obstructions are encountered.)</p> <p>Verify that the distance from the centerline of the grab bar to the nearest permanent object in back of the grab bars is no less than 4 in.</p> <p>Verify that grab bars do not protrude on the climbing side beyond the rungs of the ladder which they serve.</p> <p>Verify that the step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure is not more than 12 in., nor less than 2.5 in.</p> <p>Verify that counterweighted hatch covers open a minimum of 60 degrees from the horizontal.</p> <p>Verify that the distance from the centerline of rungs or cleats to the edge of the hatch opening on the climbing side is not less than 24 in. for offset wells or 30 in. for straight wells.</p> <p>Verify that there are no protruding potential hazards within 24 in. of the centerline of rungs or cleats.</p> <p>Verify that any hazard within 30 in. of the centerline of the rungs or cleats is fitted with deflector plates placed at an angle of 60 degrees from the horizontal.</p> <p>(NOTE: The relationship of a fixed ladder to an acceptable counterweighted hatch cover is illustrated in Figure D-6.)</p> <p>Verify that cages or wells, except on chimney ladders, are built as shown in the applicable drawings, covered in detail in Figures D-7, D-8, and D-9, or are of equivalent construction.</p> <p>Verify that cages or wells conforming to the dimensions shown in figures D-7, D-8, and D-9 are provided on ladders of more than 20 ft to a maximum unbroken length of 30 ft.</p> <p>Verify that cages extend a minimum of 42 in. above the top of landing, unless other acceptable protection is provided.</p> <p>Verify that cages extend down the ladder to a point not less than 7 ft nor more than 8 ft above the base of the ladder, with bottom flared not less than 4 in., or</p>

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	<p>portion of cage opposite ladder is carried to the base.</p> <p>Verify that cages do not extend less than 27 nor more than 28 in. from the centerline of the rungs of the ladder.</p> <p>Verify that cages are not less than 27 in. in width.</p> <p>Verify that the inside of the cage is clear of projections.</p> <p>Verify that vertical bars are located at a maximum spacing of 40 degrees around the circumference of the cage.</p> <p>Verify that ladder wells have a clear width of at least 15 in. measured each way from the centerline of the ladder.</p> <p>Verify that smooth-walled wells are a minimum of 27 in. from the centerline of rungs to the well wall on the climbing side of the ladder.</p> <p>Verify that, where other obstructions on the climbing side of the ladder exist, there is a minimum of 30 in. from the centerline of the rungs.</p> <p><b>WS.60.19.</b> Landing platforms must be provided in accordance with certain requirements (29 CFR 1910.27(d)(2)).</p> <p>Verify that, when ladders are used to ascend to heights exceeding 20 ft, landing platforms are provided for each 30 ft of height or fraction thereof, except on chimneys.</p> <p>Verify that, where no cage, well, or ladder safety device is provided, landing platforms are provided for each 20 ft of height or fraction thereof.</p> <p>Verify that each ladder section is offset from adjacent sections.</p> <p>Verify that, where installation conditions (even for a short unbroken length) require that adjacent sections be offset, landing platforms are provided at each offset.</p> <p><b>WS.60.20.</b> A landing platform must be provided when there is a step-across distance greater than 12 in. (29 CFR 1910.27(d)(2)(i)).</p> <p>Verify that, where personnel have to step a distance greater than 12 in. from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform is provided.</p> <p>Verify that the minimum step-across distance is 2.5 in.</p> <p><b>WS.60.21.</b> All landing platforms must be equipped safely (29 CFR 1910.27(d)(2)(ii)).</p> <p>Verify that all landing platforms are equipped with standard railings and toeboards, so arranged as to give safe access to the ladder.</p> <p>Verify that landings platforms are not less than 24 in. in width nor less than 30 in. in length.</p>

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<b>WS.60.22.</b> Rung spacing on landing platforms must meet certain requirements (29 CFR 1910.27(d)(2)(iii)).	<p>Verify that one rung of any section of ladder is located at the level of the landing laterally served by the ladder.</p> <p>Verify that, where access to the landing is through the ladder, the same rung spacing as used on the ladder is used from the landing platform to the first rung below the landing.</p>
<b>WS.60.23.</b> Ladder extensions must meet certain requirements (29 CFR 1910.27(d)(3)).	<p>Verify that the side rails of through or side-step ladder extensions extend 3.5 ft above parapets and landings.</p> <p>Verify that, for through ladder extensions, the rungs:</p> <ul style="list-style-type: none"> <li>- are omitted from the extensions</li> <li>- have not less than 18 in. clearance between the rails</li> <li>- have not more than 24 in. clearance between the rails.</li> </ul> <p>Verify that for side-step or offset fixed ladder sections, at landings, the side rails and rungs are carried to the next regular rung beyond or above the 3.5 ft minimum.</p> <p>(NOTE: Figure D-10 provides an illustration of offset fixed ladder sections.)</p>
<b>WS.60.24.</b> Grab-bars must meet certain requirements (29 CFR 1910.27(d)(4)).	<p>Verify that grab bars are spaced by a continuation of the rung spacing when they are located in the horizontal position.</p> <p>Verify that vertical grab bars have the same spacing as the ladder side rails.</p> <p>Verify that grab bar diameters are the equivalent of the round-rung diameters.</p> <p>(NOTE: Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 ft in unbroken length in lieu of cage protection. No landing platform is required in these cases.)</p>
<b>WS.60.25.</b> All ladder safety devices must meet the design requirements of the ladders which they serve (29 CFR 1910.27(d)(5)).	<p>Verify that all ladder safety devices such as those that incorporate lifebelts, friction brakes, and sliding attachments meet the design requirements of the ladders which they serve.</p>
<b>WS.60.26.</b> Ladders having a pitch in excess of 90 degrees are prohibited (29 CFR 1910.27(e)(4)).	<p>Verify that ladders having a pitch in excess of 90 degrees with the horizontal are not used.</p>

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<b>WS.60.27.</b> Ladders having substandard pitch must be avoided, if possible (29 CFR 1910.27(e)(2)).	Verify that ladders having substandard pitch range are avoided, if possible.  Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation.  (NOTE: The preferred pitch of fixed ladders is in the range of 75 and 90 degrees with the horizontal. Substandard pitch of fixed ladders is in the range of 60 and 75 degrees with the horizontal.)  (NOTE: See 29 CFR 1910.28, Figure D-11 for an illustration of pitch of fixed ladders.)



## **CHAPTER 42**

### **MEANS OF EGRESS**

**CHAPTER 42**  
**SAFETY: MEANS OF EGRESS**

**ECAMP-ANG**

**September 1997**

**Applicability**

Compliance with the provisions of this chapter are not to be construed as eliminating or reducing the necessity for other provisions for safety of persons using a structure under normal occupancy conditions, nor must any of these provisions be construed as requiring or permitting any condition that may be hazardous under normal occupancy conditions.

**Compliance Definitions**

- *Approved* - approved means, unless otherwise indicated, listed or approved equipment by a nationally recognized testing laboratory. Refer to 29 CFR 1910.155(c)(3)(iv)(A) for definition of *listed*, and to 29 CFR 1910.7 for *nationally recognized testing laboratory* (29 CFR 1910.35(h)).
- *Class A Ramp* - a ramp with a width of 44 inches or greater, a slope of 1 to 1-3/16 inches in 12 inches, and an unlimited maximum height between landings. (29 CFR 1910.37, Table E-1).
- *Class B Ramp* - a ramp with a width of 30 to 40 inches, a slope of 1-3/16 to 2 inches in 12 inches, and a maximum height between landings of 12 feet. (29 CFR 1910.37, Table E-1).
- *Emergency Action Plan* - a plan for a workplace, or parts thereof, describing what procedures personnel must take to ensure safety from fire or other emergencies (29 CFR 1910.35(i)).
- *Emergency Escape Route* - the route that personnel are directed to follow in the event they are required to evacuate the workplace or seek a designated refuge area (29 CFR 1910.35(j)).
- *Exit* - that portion of a means of egress which is separated from all other spaces of the building or structure by construction or equipment as required in 29 CFR 1910, Subpart E, to provide a protected way of travel to the exit discharge (29 CFR 1910.35(c)).
- *Exit Access* - that portion of a means of egress which leads to an entrance to an exit (29 CFR 1910.35(b)).
- *Exit Discharge* - that portion of a means of egress between the termination of an exit and a public way (29 CFR 1910.35(d)).
- *High Hazard Contents* - those contents which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of fire (29 CFR 1910.35(f)).
- *Low Hazard Contents* - those contents of such low combustibility that no self-propagating fire therein can occur and that consequently the only probable danger requiring the use of emergency exits will be from panic, fumes, or smoke, or fire from some external source (29 CFR 1910.35(e)).

- *Means of Egress* - a continuous and unobstructed way of exit travel from any point in a building or structure to a public way. It consists of three separate and distinct parts: the way of exit access, the exit, and the way of exit discharge. A means of egress comprises the vertical and horizontal ways of travel and includes intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards (29 CFR 1910.35(a)).
- *Occupant Load* - the maximum number of persons that may be in a space at any time (29 CFR 1910.37(d)(1)).
- *Ordinary Hazard Contents* - those contents which are liable to burn with moderate rapidity and to give off a considerable volume of smoke but from which neither poisonous fumes nor explosions are to be feared in case of fire (29 CFR 1910.35(g)).

## **SAFETY: MEANS OF EGRESS**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Fundamental Requirements	ME.10.1 through ME.10.12	42-5
General Requirements	ME.20.1 through ME.20.18	42-9
Emergency Action Plans and Fire Prevention Plans	ME.30.1 through ME.30.6	42-15



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<p><b>ME.10 FUNDAMENTAL REQUIREMENTS</b></p> <p><b>ME.10.1.</b> Every building or structure, new or old, designed for human occupancy must be provided with exits sufficient to permit the prompt escape of occupants in case of fire or other emergency (29 CFR 1910.36(b)(1)).</p> <p><b>ME.10.2.</b> Every building or structure must be so constructed, arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or structure in case of fire or other emergency (29 CFR 1910.36(b)(2)).</p> <p><b>ME.10.3.</b> Every building or structure must be provided with exits of kinds, numbers, location, and capacity appropriate to the individual building or structure so as to afford all occupants convenient facilities for escape (29 CFR 1910.36(b)(3)).</p>	<p>Verify that all installation buildings designed for human occupancy have exits sufficient to permit the prompt escape of occupants in case of fire or other emergency.</p> <p>Verify that the design of exits and other safeguards is such that reliance for safety to life in case of fire or other emergency will not depend solely on any single safeguard.</p> <p>Verify that additional safeguards are provided for life safety in case any single safeguard is ineffective due to some human or mechanical failure.</p> <p>Verify that all installation buildings or structures are so constructed, arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of their occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or structure in case of fire or other emergency.</p> <p>Verify that all installation buildings or structures are provided with exits of kinds, numbers, location, and capacity appropriate to the individual building or structure so as to afford all occupants convenient facilities for escape.</p> <p>(NOTE: Due regard must be given to the character of the occupancy, the number of persons exposed, the fire protection available, and the height and type of construction of the building or structure.)</p>

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<p><b>ME.10.4.</b> Exits in all installation buildings and structures must meet certain requirements (29 CFR 1910.36(b)(3) through 29 CFR 1910.36(b)(5) and 29 CFR 1910.37(j)).</p>	<p>Verify that exits are so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied.</p> <p>Verify that there are no locks or fastenings that prevent free escape from the inside of any building.</p> <p>(NOTE: This provision does not apply to mental, penal, or corrective institutions where supervisory personnel are continually on duty and effective provisions are made to remove occupants in case of fire or other emergency.)</p> <p>Verify that all exits are clearly visible or that the routes to reach them are conspicuously indicated in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point.</p> <p>Verify that each path of escape, in its entirety, is so arranged or marked that the way to a place of safety outside is unmistakable.</p> <p>Verify that any doorway or passageway not constituting an exit or way to reach an exit, but of such a character as to be subject to being mistaken for an exit, is so arranged or marked as to minimize its possible confusion with an exit.</p>
<p><b>ME.10.5.</b> In every building or structure equipped for artificial illumination, adequate and reliable illumination must be provided for all exit facilities (29 CFR 1910.36(b)(6)).</p>	<p>Verify that adequate and reliable illumination is provided for all exit facilities in every building or structure equipped for artificial illumination.</p>
<p><b>ME.10.6.</b> Fire alarm facilities must be provided in certain buildings or structures (29 CFR 1910.36(b)(7)).</p>	<p>Verify that fire alarm facilities are provided in every building or structure of such size, arrangement, or occupancy that a fire may not itself provide adequate warning to occupants.</p>
<p><b>ME.10.7.</b> At least two means of egress remote from each other must be provided in certain in certain facilities (29 CFR 1910.36(b)(8)).</p>	<p>Verify that every building or structure, section, or area thereof of such size, occupancy, and arrangement that the reasonable safety of numbers of occupants may be endangered by the blocking of any single means of egress due to fire or smoke has at least two means of egress remote from each other.</p> <p>Verify that the means of egress are so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency conditions.</p>

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<b>ME.10.8.</b> Buildings or structures under construction must not be occupied in whole or in part until all exit facilities required for the part occupied are completed and ready for use (29 CFR 1910.36(c)(1)).	Verify that no building or structure under construction is occupied in whole or in part until all exit facilities required for the part occupied are completed and ready for use.
<b>ME.10.9.</b> Existing buildings must not be occupied during repairs or alterations unless certain conditions are met (29 CFR 1910.36(c)(2)).	Verify that no existing building is occupied during repairs or alterations unless all existing exits and any existing fire protection are continuously maintained, or unless other measures are taken which provide equivalent safety.
<b>ME.10.10.</b> Flammable or explosive substances or equipment for repairs or alterations must not be introduced in a building of normally low or ordinary hazard classification while the building is occupied unless certain conditions are met (29 CFR 1910.36(c)(3)).	Verify that no flammable or explosive substances or equipment for repairs or alterations is introduced in a building of normally low or ordinary hazard classification (see definitions) while the building is occupied unless the condition of use and safeguards provided are such as not to create any additional danger or handicap to egress beyond the normally permissible conditions in the building.
<b>ME.10.11.</b> Maintenance of exits, ways of approach to exits, and ways of travel from exits into streets or open spaces must meet certain requirements (29 CFR 1910.36(d)(1)).	Verify that exits, ways of approach to exits, and ways of travel from exits into streets or open spaces are continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.
<b>ME.10.12.</b> Specific facilities and equipment must be kept continuously in proper operating condition (29 CFR 1910.36(d)(2)).	Verify that every automatic sprinkler system, fire detection and alarm system, all exit lighting, fire doors, and other items of equipment, where provided, are continuously in proper operating condition.



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<p><b>ME.20</b> <b>GENERAL</b> <b>REQUIREMENTS</b></p> <p><b>ME.20.1.</b> Exit components must meet certain requirements (29 CFR 1910.37(a)).</p> <p><b>ME.20.2.</b> When an exit is protected by separation from other parts of the building the separating construction must meet certain requirements (29 CFR 1910.37(b)(1) through 29 CFR 1910.37(b)(4)).</p> <p><b>ME.20.3.</b> The capacity in number of persons per unit of exit width for approved components of means of egress must meet specific standards (29 CFR 1910.37(c)(1)).</p> <p><b>ME.20.4.</b> The capacity of means of egress for any floor, balcony, tier, or other occupied space must be sufficient for the occupant load of that floor, balcony, tier, or occupied space (29 CFR 1910.37(d)).</p>	<p>Verify that exits are only of the approved components.</p> <p>Verify that exit components are constructed as an integral part of the building or are permanently affixed to the building.</p> <p>Verify that the separation has at least a 1-hr fire resistance rating when the exit connects three stories or less.</p> <p>(NOTE: This applies whether the stories connected are above or below the story at which exit discharge begins.)</p> <p>Verify that the separation has at least a 2-hr fire resistance rating when the exit connects four or more stories, whether above or below the floor of discharge.</p> <p>Verify that the separation is constructed of noncombustible materials and is supported by construction having at least a 2-hr fire resistance rating.</p> <p>Verify that any opening in the separation is protected by an approved self-closing fire door.</p> <p>Verify that openings in exit enclosures are confined to those necessary for access to the enclosure from normally occupied spaces and for egress from the enclosure.</p> <p>Verify that the capacity in number of persons per unit of exit width for approved components of means of egress is as follows:</p> <ul style="list-style-type: none"> <li>- for Level Egress Components (including Class A Ramps), 100 persons</li> <li>- for Inclined Egress Components (including Class B Ramps), 60 persons.</li> </ul> <p>Verify that the capacity of means of egress for any floor, balcony, tier, or other occupied space is sufficient for the occupant load of that floor, balcony, tier, or occupied space.</p> <p>(NOTE: Where exits serve more than one floor, only the occupant load of each floor considered individually need be used in computing the capacity of the exits at that floor, provided that exit capacity is not decreased in the direction of exit travel.)</p>

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<p><b>ME.20.5.</b> When more than one exit is required from a story, the arrangement of at least two of the exits must meet certain requirements (29 CFR 1910.37 (e)).</p> <p><b>ME.20.6.</b> Access to exits must meet specific requirements (29 CFR 1910.37(f)).</p>	<p>Determine whether more than one exit is required from a story.</p> <p>Verify that at least two of the exits are remote from each other.</p> <p>Verify that at least two of the exits are so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency condition.</p> <p>Verify that exits are so located and access is so arranged that exits are readily accessible at all times.</p> <p>Verify that, where exits are not immediately accessible from an open floor area, safe and continuous passageways, aisles, or corridors leading directly to every exit are provided.</p> <p>Verify that those continuous passageways, aisles, or corridors are so arranged as to provide convenient access for each occupant to at least two exits by separate ways of travel.</p> <p>(NOTE: This provision does not apply if a single exit or limited dead ends are permitted.)</p> <p>Verify that any doors from rooms to an exit or to a way of exit access are of the side-hinged, swinging type.</p> <p>Verify that the door from a room to an exit or to a way of exit access swings with exit travel when the room is occupied by more than 50 persons or used for a high hazard occupancy.</p> <p>Verify that access to an exit is never through a bathroom, or other room subject to locking.</p> <p>(NOTE: This provision does not apply where the exit is required to serve only the room subject to locking.)</p> <p>Verify that ways of exit access and the doors to exits to which they lead are so designed and arranged as to be clearly recognizable as such.</p> <p>Verify that no hangings or draperies are placed over exit doors or otherwise so located as to conceal or obscure any exit.</p> <p>Verify that no mirrors are placed on exit doors or adjacent to any exit in such a manner as to confuse the direction of exit.</p> <p>Verify that exit access is so arranged that it is not necessary to travel toward any area of high hazard occupancy in order to reach the nearest exit.</p> <p>(NOTE: This provision does not apply if the path of travel is effectively shielded</p>

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<p><b>ME.20.7.</b> Ways of access to an exit by means of any exterior balcony, porch, gallery, or roof must meet certain requirements (29 CFR 1910.37(g)).</p>	<p>from the high hazard location by suitable partitions or other physical barriers.)</p> <p>Verify that the minimum width of any way of exit access is never less than 28 in.</p> <p>Verify that, if a single way of exit access leads to an exit, its capacity in terms of width is at least equal to the required capacity of the exit to which it leads.</p> <p>Verify that, where more than one way of exit access leads to an exit, each has a width adequate for the number of persons it must accommodate.</p> <p>Verify that exterior ways of exit access have smooth, solid floors that are substantially level, and that they have guards on the unenclosed sides.</p> <p>Verify that, where accumulation of snow or ice is likely because of the climate, the exterior way of exit access is protected by a roof.</p> <p>(NOTE: This requirement does not apply if the exterior way of access serves as the sole normal means of access to the rooms or spaces served, in which case it may be assumed that snow and ice will be regularly removed in the course of normal occupancy.)</p> <p>Verify that a permanent, reasonably straight path of travel is maintained over the required exterior way of exit access.</p> <p>Verify that there is no obstruction by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other uses.</p> <p>Verify that exterior ways of exit access are so arranged that there are no dead ends in excess of 20 ft.</p> <p>Verify that any unenclosed exit served by an exterior way of exit access is so located that no part of the exit extends past a vertical plane 20 ft. and one-half the required width of the exit from the end of and at right angles to the way of exit access.</p> <p>Verify that any gallery, balcony, bridge, porch, or other exterior exit access that projects beyond the outside wall of the building complies with the requirements of this chapter as to width and arrangement.</p> <p><b>ME.20.8.</b> All exits must discharge directly to the street, or to a yard, court, or other open space that gives safe access to a public way (29 CFR 1910.37(h)(1)).</p> <p>Verify that all exits discharge directly to the street, or to a yard, court, or other open space that gives safe access to a public way.</p> <p>Verify that streets to which the exits discharge are of width adequate to accommodate all persons leaving the building.</p> <p>Verify that yards, courts, or other open spaces to which exits discharge are also of</p>

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<p><b>ME.20.9.</b> Stairs and other exits must be so arranged as to make clear the direction of egress to the street (29 CFR 1910.37(h)(2)).</p> <p><b>ME.20.10.</b> Exit stairs that continue beyond the floor of discharge must be interrupted at the floor of discharge by partitions, doors, or other effective means (29 CFR 1910.37(h)(2)).</p> <p><b>ME.20.11.</b> Means of egress must be so designed and maintained as to provide adequate head-room (29 CFR 1910.37(i)).</p> <p><b>ME.20.12.</b> Where means of egress are not substantially level, differences in elevation must be negotiated by stairs or ramps (29 CFR 1910.37(j)).</p> <p><b>ME.20.13.</b> Maintenance and workmanship of means of egress must meet specific requirements (29 CFR 1910.37(k)).</p>	<p>adequate width and size to provide all persons leaving the building with ready access to the street.</p> <p>Verify that stairs and other exits are so arranged as to make clear the direction of egress to the street.</p> <p>Verify that exit stairs that continue beyond the floor of discharge are interrupted at the floor of discharge by partitions, doors, or other effective means.</p> <p>Verify that means of egress are so designed and maintained as to provide adequate headroom.</p> <p>Verify that the ceiling height is not less than 7 ft. 6 in.</p> <p>Verify that no projection from the ceiling is less than 6 ft. 8 in. from the floor.</p> <p>Verify, where means of egress are not substantially level, that differences in elevation are negotiated by stairs or ramps.</p> <p>Verify that doors, stairs, ramps, passages, signs, and all other components of means of egress are of substantial, reliable construction and are built or installed in a workmanlike manner.</p> <p>Verify that means of egress are continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.</p> <p>Verify that no device or alarm installed to restrict the improper use of an exit is so designed and installed that it can, even in cases of failure, impede or prevent emergency use of such exit.</p>

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<b>ME.20.14.</b> Furnishings or decorations near exits are subject to certain requirements (29 CFR 1910.37(l)).	<p>Verify that no furnishings, decorations, or other objects are so placed as to obstruct exits, access to exits, egress from exits, or the visibility of exits.</p> <p>Verify that no furnishings or decorations of an explosive or highly flammable character are used in any occupancy.</p>
<b>ME.20.15.</b> Automatic sprinkler systems are subject to maintenance, inspection, and testing requirements (29 CFR 1910.37(m)).	<p>Verify that all automatic sprinkler systems are continuously maintained in reliable operating condition at all times.</p> <p>Verify that such periodic inspections and tests are made as are necessary to assure proper maintenance.</p>
<b>ME.20.16.</b> Fire alarm signaling systems are subject to certain maintenance and testing requirements (29 CFR 1910.37(n)).	<p>Verify that fire alarm signaling systems are maintained and tested in accordance with the requirements of 29 CFR 1910.165(d).</p>
<b>ME.20.17.</b> Fire retardant paints or solutions used in connection with means of egress must be renewed at such intervals as necessary to maintain the necessary flame retardant properties (29 CFR 1910.37(o)).	<p>Verify that fire retardant paints or solutions are renewed frequently enough to maintain the necessary flame retardant properties.</p>
<b>ME.20.18.</b> Exit marking must meet specific requirements (29 CFR 1910.37 (q)).	<p>Verify that exits are marked by a readily visible sign.</p> <p>Verify that access to exits is marked by readily visible signs in all cases where the exit itself or the way to reach it is not immediately visible to the occupants.</p> <p>Verify that any door, passage, or stairway which is neither an exit nor a way of exit access, and which is so located or arranged as to be likely to be mistaken for an exit, is identified by a sign reading NOT AN EXIT or similar designation, or that it is identified by a sign indicating its actual character, such as TO BASEMENT, STOREROOM, LINEN CLOSET, or the like.</p> <p>Verify that every required sign designating an exit or way of exit access is so located and of such size, color, and design as to be readily visible.</p> <p>Verify that there no decorations, furnishings, or equipment which impair visibility of an exit sign.</p>

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	<p>Verify that there is no brightly illuminated sign (for other than exit purposes), display, or object in or near the line of vision to the required exit sign of such a character as to detract attention from the exit sign so that it may not be noticed.</p> <p>Verify that every exit sign is distinctive in color and provides contrast with decorations, interior finish, or other signs.</p> <p>Verify that a sign reading EXIT, or similar designation, with an arrow indicating the direction, is placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.</p> <p>Verify that every exit sign is suitably illuminated by a reliable light source giving a value of not less than 5 foot-candles on the illuminated surface.</p> <p>Verify that artificial lights giving illumination to exit signs other than the internally illuminated types have screens, discs, or lenses of not less than 25 in<sup>2</sup> area made of translucent material to show red or other specified designating color on the side of the approach.</p> <p>Verify that an internally illuminated exit sign is provided in all occupancies where reduction of normal illumination is permitted.</p> <p>Verify that every exit sign has the word EXIT in plainly legible letters not less than 6-in. high, with the principal strokes of letters not less than 0.75-in. wide.</p>

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<p><b>ME.30</b>  <b>EMERGENCY ACTION PLANS AND FIRE PREVENTION PLANS</b></p> <p><b>ME.30.1.</b> The Installation Emergency Action Plan must meet specific requirements (29 CFR 1910.38(a)(1), 29 CFR 1910.38(a)(2), 29 CFR 1910.38(a)(4), and 29 CFR 1910.38(a)(5)(iii)).</p> <p><b>ME.30.2.</b> Employee alarm systems are subject to certain requirements (29 CFR 1910.38(a)(3)).</p>	<p>(NOTE: The requirements in ME.30 apply to all Emergency Action Plans and Fire Prevention Plans required by a particular OSHA Standard.)</p> <p>Verify that the installation has a written Emergency Action Plan and that it covers those designated actions that must be taken in order to ensure safety from fire and other emergencies.</p> <p>(NOTE: Installations with 10 or fewer personnel may communicate the plan to personnel orally, and no written plan need be maintained.)</p> <p>Verify that the Emergency Action Plan includes the following elements, at a minimum:</p> <ul style="list-style-type: none"> <li>- emergency escape procedures and emergency escape route assignments</li> <li>- procedures to be followed by personnel who remain to operate critical plant operations before they evacuate</li> <li>- procedures to account for all employees after emergency evacuation has been completed</li> <li>- rescue and medical duties for those employees who are to perform them</li> <li>- the preferred means of reporting fires and other emergencies</li> <li>- names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan</li> <li>- the types of evacuation to be used in emergency circumstances.</li> </ul> <p>Verify that the written plan is kept at the workplace and made available for review by personnel.</p> <p>Verify that the employee alarm system provides warning for one or both of the following:</p> <ul style="list-style-type: none"> <li>- necessary emergency action as called for in the emergency action plan</li> <li>- reaction time for safe escape of personnel from the workplace or the immediate work area.</li> </ul> <p>Verify that the alarm can be perceived above ambient noise or light levels by all personnel in the affected portions of the workplace.</p> <p>(NOTE: Tactile devices may be used to alert personnel who would not otherwise be able to recognize the audible or visual alarm.)</p> <p>Verify that the employee alarm is distinctive and recognizable as a signal to evacuate the work area or carry out the emergency action plan.</p>

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	<p>Verify that the employer explains to all personnel the preferred means of reporting emergencies.</p> <p>Verify that, when telephones serve as a means of reporting emergencies, the employer posts emergency telephone numbers near telephones, or employee notice boards, and other conspicuous locations.</p> <p>Verify that, where a communication system also serves as the employee alarm system, all emergency messages have priority over all non-emergency messages.</p> <p>Verify that there are established procedures for sounding emergency alarms in the workplace.</p> <p>(NOTE: Direct voice communication is an acceptable provision for sounding the alarm in installations employing 10 or fewer individuals in a particular workplace, provided all personnel can hear the alarm. Such workplaces need not have a back-up system.)</p> <p>Verify that all devices, components, combinations of devices, or systems constructed and installed as part of the employee alarm system are approved.</p> <p>(NOTE: The following devices are considered to be approved if they meet the requirements of 29 CFR 1910.165:</p> <ul style="list-style-type: none"> <li>- steam whistles</li> <li>- air horns</li> <li>- strobe lights or similar lighting devices</li> <li>- tactile devices.)</li> </ul> <p>Verify that employee alarm systems are restored to normal operating condition as promptly as possible after each test or alarm.</p> <p>Verify that spare alarm devices and components subject to wear or destruction are available in sufficient quantities and location for prompt restoration.</p> <p>Verify that employee alarm systems are maintained in operating condition, except when undergoing repairs or maintenance.</p> <p>Verify that a test of the reliability and adequacy of nonsupervised employee alarm systems is made every 2 mo.</p> <p>Verify that a different actuation device is used in each test of a multi-actuation device system so that no individual device is used for two consecutive tests.</p> <p>Verify that the installation maintains or replaces power supplies as often as is necessary to assure a fully operational condition.</p>

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<p><b>ME.30.3.</b> Certain training requirements must be met with regard to the Emergency Action Plan (29 CFR 1910.38(a)(5)).</p>	<p>Verify that, when systems are out of service, back-up means of alarm such as employee runners or telephones are provided.</p> <p>Verify that there is supervision of employee alarm circuitry that is capable of supervision and was installed after 1 January 1981.</p> <p>Verify that the supervision of employee alarm circuitry provides positive notification to assigned personnel whenever a deficiency exists in the system.</p> <p>Verify that the servicing, maintenance, and testing of employee alarms is done by persons trained in the designed operation and functions necessary for reliable and safe operation of the system.</p> <p>Verify that manually operated actuation devices for use in conjunction with employee alarms are unobstructed, conspicuous, and readily accessible.</p> <p>Verify that, where the alarm system is used for alerting fire brigade members or for other purposes, a distinctive signal is used for each purpose.</p> <p>Verify that the installation designates and trains a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees, before implementing the emergency action plan.</p> <p>Verify that the plan is reviewed with all personnel covered by the plan at the following times:</p> <ul style="list-style-type: none"> <li>- initially when the plan is developed</li> <li>- whenever an individual's responsibilities or designated actions under the plan change</li> <li>- whenever the plan itself is changed.</li> </ul> <p>Verify that those parts of the plan which personnel must know to protect themselves in the event of an emergency are reviewed with each individual upon initial assignment.</p>
<p><b>ME.30.4.</b> The Installation Fire Prevention Plan must meet specific requirements (29 CFR 1910.38(b)).</p>	<p>Verify that the installation has a written Fire Prevention Plan.</p> <p>(NOTE: Installations with 10 or fewer personnel may communicate the plan to personnel orally, and no written plan need be maintained.)</p> <p>Verify that the Fire Prevention Plan includes the following elements, at a minimum:</p> <ul style="list-style-type: none"> <li>- a list of the major workplace fire hazards and their proper handling and storage procedures</li> </ul>

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<p><b>ME.30.5.</b> Certain training requirements must be met with regard to the Fire Prevention Plan (29 CFR 1910.38(b)(4)).</p> <p><b>ME.30.6.</b> The installation must regularly and properly maintain, according to established procedures, equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials (29 CFR 1910.38(b)(5)).</p>	<ul style="list-style-type: none"> <li>- a list of potential ignition sources (such as welding, smoking and others) and their control procedures, and the type of fire protection equipment or systems which can control a fire involving them</li> <li>- names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires</li> <li>- names or regular job titles of those personnel responsible for control of fuel source hazards</li> <li>- housekeeping procedures directed at controlling accumulations of flammable and combustible waste materials and residues so that they do not contribute to a fire emergency</li> <li>- established maintenance procedures for systems and equipment installed on heat producing equipment to prevent accidental ignition of combustible materials.</li> </ul> <p>Verify that the written plan is kept in the workplace and made available for review by personnel.</p> <p>Verify that personnel are apprised of the fire hazards of the materials and processes to which they are exposed.</p> <p>Verify that the installation reviews with all personnel upon initial assignment those parts of the fire prevention plan which they must know to protect themselves in the event of an emergency.</p> <p>Verify that the installation regularly and properly maintains equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials.</p> <p>Verify that the maintenance is carried out according to established procedures.</p>

## **CHAPTER 43**

### **HAZARDOUS MATERIALS**

## CHAPTER 43

### SAFETY: HAZARDOUS MATERIALS

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#### Compliance Definitions

- *Approved* - unless otherwise indicated, listed or approved equipment by a nationally recognized testing laboratory. Refer to 29 CFR 1910.155(c)(3)(iv)(A) for definition of *listed*, and to 29 CFR 1910.7 for *nationally recognized testing laboratory* (29 CFR 1910.103(a)(ii)).
- *ASME* - American Society of Mechanical Engineers (29 CFR 1910.103(a)(iv)).
- *Bulk Oxygen System* - an assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, which has storage capacity of more than 13,000 ft<sup>3</sup> of oxygen, Normal Temperature and Pressure (NTP), connected in service or ready for service, or more than 25,000 ft<sup>3</sup> of oxygen (NTP) including unconnected reserves on hand at the installation. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. Oxygen containers may be stationary or moveable, and the oxygen may be stored as gas or liquid (29 CFR 1910.104(b)(1)).
- *DOT Regulations* - see *DOT Specifications* (29 CFR 1910.103(a)(v)).
- *DOT Specifications* - Regulations of the Department of Transportation (DOT), published in 49 CFR Chapter I (29 CFR 1910.103(a)(v)).
- *Exposure* - such things as buildings, structures, wall openings, flammable gaseous or liquid storage (above ground and below ground), combustible materials, occupancies inside buildings, and so forth (Appendix 43-1).
- *Gaseous Hydrogen System* - a system in which hydrogen is delivered, stored, and discharged in the gaseous form to consumer piping. The system includes stationary or movable containers, pressure regulators, safety relief devices, manifolds, interconnecting piping, and controls. The system terminates at the point where hydrogen at service pressure first enters the consumer's distribution piping (29 CFR 1910.103(a)(1)).
- *Listed* - see *approved* (29 CFR 1910.103).
- *Outdoor Locations* - locations outside of any building or structure, including locations under a weather shelter or canopy provided that such locations are not enclosed by more than two walls set at right angles and have vent space between the walls and vented roof or canopy (29 CFR 1910.103(c)(3)(i)(a)).



## SAFETY: HAZARDOUS MATERIALS

### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
Compressed Gases	HZ.10.1 and HZ.10.2	43-5
Hydrogen		
Gaseous Hydrogen Systems	HZ.20.1 through HZ.20.30	43-7
Liquefied Hydrogen Systems	HZ.30.1 through HZ.30.36	43-13
Oxygen	HZ.40.1 through HZ.40.29	43-21
Nitrous Oxide	HZ.50.1	43-27

  

Appendix 43-1, <i>Minimum Distance in Feet from a Hydrogen System to Any Specified Outdoor Enclosure</i>	43-29
Appendix 43-2, <i>Order of Preference for Location of a Hydrogen System</i>	43-31
Appendix 43-3, <i>Maximum Total Quantity of Liquefied Hydrogen Storage Permitted</i>	43-33
Appendix 43-4, <i>Minimum Distance (Feet) from Liquefied Hydrogen Systems to Exposure</i>	43-35
Appendix 43-5, <i>Bulk Oxygen Systems</i>	43-37



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<p><b>HZ.10</b>  <b>COMPRESSED GASES</b></p> <p><b>HZ.10.1.</b> Installations must determine by visual inspection that compressed gas cylinders are in a safe condition (29 CFR 1910.101(a)).</p> <p><b>HZ.10.1.</b> Compressed gas cylinders, portable tanks, and cargo tanks must have pressure relief devices (29 CFR 1910.101(c)).</p>	<p>Verify that the installation conducts visual inspection of its compressed gas cylinders.</p> <p>Verify that the installation installs and maintains pressure relief devices in compressed gas cylinders, portable tanks, and cargo tanks.</p>



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<p><b>HYDROGEN</b></p> <p><b>HZ.20</b> <b>Gaseous Hydrogen Systems</b></p> <p><b>HZ.20.1.</b> Gaseous hydrogen containers must meet specific requirements (29 CFR 1910.103 (b)(1)(i)).</p> <p><b>HZ.20.2.</b> Hydrogen containers must be equipped with safety relief devices (29 CFR 1910.103(b)(1)(ii)(a)).</p> <p><b>HZ.20.3.</b> Safety relief devices must meet specific requirements (29 CFR 1910.103(b)(1)(ii)(b) and 1910.103(b)(1)(ii)(c)).</p> <p><b>HZ.20.4.</b> Piping, tubing, and fittings must meet specific requirements (29 CFR 1910.103(b)(1)(iii) (a) and 1910.103 (b)(1)(iii)(b)).</p> <p><b>HZ.20.5.</b> Gaskets and thread sealants must be suitable for hydrogen service (29 CFR 1910.103(b)(1)(iii)(c)).</p>	<p>(NOTE: The checklist items in HZ.20 apply to the installation of gaseous hydrogen systems on consumer premises where the hydrogen supply to the consumer premises originates outside the premises and is delivered by mobile equipment. They do <i>not</i> apply to either of the following:</p> <ul style="list-style-type: none"> <li>- gaseous hydrogen systems having a total hydrogen content of less than 400 ft<sup>3</sup></li> <li>- hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or supplier's agent for the purpose of storing hydrogen and refill-ing portable containers, trailers, mobile supply trucks, or tank cars.)</li> </ul> <p>Verify that permanently installed hydrogen containers are provided with substantial noncombustible supports on firm noncombustible foundations.</p> <p>Verify that each manifolded hydrogen supply unit is marked legibly with the word HYDROGEN or a legend such as THIS UNIT CONTAINS HYDROGEN.</p> <p>Verify that hydrogen containers are equipped with safety relief devices.</p> <p>Verify that safety relief devices are arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container, adjacent structure, or personnel.</p> <p>(NOTE: The above requirement does not apply to DOT Specification containers having an internal volume of 2 ft<sup>3</sup> or less.)</p> <p>Verify that safety relief devices or vent piping are designed or located so that moisture cannot collect and freeze in a manner that might interfere with proper operation of the device.</p> <p>Verify that piping, tubing, and fittings are suitable for hydrogen service and for the pressures and temperatures involved.</p> <p>Verify that the installation does not use cast iron piping and fittings.</p> <p>Verify that gaskets and thread sealants in piping and tubing joints are suitable for hydrogen service.</p> <p>(NOTE: Joints in piping and tubing may be made by welding or brazing or by use of flanged, threaded, socket, or compression fittings.)</p>

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<b>HZ.20.6.</b> Valves, gauges, regulators, and other accessories must be suitable for hydrogen service (29 CFR 1910.103(b)(1)(iv)(a)).	Verify that valves, gauges, regulators, and other accessories are suitable for hydrogen service.
<b>HZ.20.7.</b> The installation of hydrogen systems must be supervised (29 CFR 1910.103(b)(1)(iv)(b)).	Verify that the installation of hydrogen systems is supervised by personnel familiar with the proper practices for their construction and use.
<b>HZ.20.8.</b> Storage containers, piping, valves, regulating equipment, and other accessories must be readily accessible and adequately protected (29 CFR 1910.103(b)(1)(iv)(c)).	Verify that storage containers, piping, valves, regulating equipment, and other accessories are readily accessible and protected against physical damage and tampering.
<b>HZ.20.9.</b> Cabinets or housings containing hydrogen system equipment must be adequately ventilated (29 CFR 1910.103(b)(1)(iv)(d)).	Verify that cabinets or housings containing hydrogen control or operating equipment are adequately ventilated.
<b>HZ.20.10.</b> Mobile hydrogen supply units used as part of a hydrogen system must meet specific requirements (29 CFR 1910.103(b)(1)(iv)(e) and 1910.103(b)(1)(iv)(f)).	Verify that each mobile hydrogen supply unit used as part of a hydrogen system is adequately secured to prevent movement.  Verify that mobile supply units are electrically bonded to the system before discharging hydrogen.
<b>HZ.20.11.</b> Hydrogen storage locations must be permanently placarded (29 CFR 1910.103(b)(1)(v)).	Verify that hydrogen storage locations are placarded with HYDROGEN - FLAMMABLE GAS - NO SMOKING - NO OPEN FLAMES or some similar warning.
<b>HZ.20.12.</b> Piping, tubing, and fittings must be tested after installation (29 CFR 1910.103(b)(1)(vi)).	Verify that after installation, all piping, tubing, and fittings have been tested and proved to be hydrogen gas-tight at maximum operating pressure.
<b>HZ.20.13.</b> The location of gaseous hydrogen systems must meet specific requirements (29 CFR	Verify that gaseous hydrogen systems are readily accessible to delivery equipment and authorized personnel.  Verify that systems are aboveground.

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<p>1910.103(b)(2)(i)).</p> <p><b>HZ.20.14.</b> The location of gaseous hydrogen systems must be in a specific order of preference as determined by the maximum total contained volume of hydrogen (29 CFR 1910.103(b)(2)(ii)(a)).</p> <p><b>HZ.20.15.</b> Gaseous hydrogen systems must be located a minimum distance from specified outdoor exposure (29 CFR 1910.103(b)(2)(ii)(b)).</p> <p><b>HZ.20.16.</b> The siting of gaseous hydrogen systems of less than 3000 CF that are located inside buildings and exposed to other occupancies must meet specific requirements (29 CFR 1910.103(b)(2)(ii)(d)).</p>	<p>Verify that systems are not located beneath electric power lines.</p> <p>Verify that systems are not near flammable liquid piping or the piping of other flammable gases.</p> <p>Verify that systems near aboveground flammable liquid storage are on ground higher than the flammable liquid storage.</p> <p>(NOTE: This requirement does not apply when dikes, diversion curbs, grading, or separating solid walls are used to prevent accumulation of flammable liquids under the system.)</p> <p>Verify that hydrogen gas systems are situated according the order of preference out lined in Appendix 43-2.</p> <p>Verify that gaseous hydrogen systems located outdoors, in separate buildings, or in special rooms are kept a minimum distance in feet from specified outdoor exposure, as outlined in Appendix 43-1.</p> <p>Verify that gaseous hydrogen systems of less than 3000 CF that are located inside buildings and exposed to other occupancies are situated in the building so that the system is:</p> <ul style="list-style-type: none"> <li>- in an adequately ventilated area as specified in 29 CFR 1910.103(b)(3)(ii)(b) (see checklist item HZ.20.19)</li> <li>- 20 ft from stored flammable materials or oxidizing gases</li> <li>- 25 ft from open flames, ordinary electrical equipment, or other sources of ignition</li> <li>- 25 ft from concentrations of people</li> <li>- 50 ft from intakes of ventilation or air-conditioning equipment and air compressors</li> <li>- 50 ft from other flammable gas storage</li> <li>- protected against damage or injury due to falling objects or working activity in the area.</li> </ul> <p>Verify that, if more than one system of 3000 CF or less is installed in the same room, the systems are separated by at least 50 ft and each of the systems meets all of the above requirements.</p>

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<b>HZ.20.17.</b> Outdoor locations for gaseous hydrogen systems must meet specific requirements (29 CFR 1910.103(b)(3) (i)).	<p>Verify that protective walls or roofs, where provided, are constructed of noncombustible materials.</p> <p>Verify that, where the enclosing sides adjoin each other, the area is properly ventilated.</p> <p>Verify that electrical equipment within 15 ft of the system meets the requirements of 29 CFR 1910, subpart S.</p>
<b>HZ.20.18.</b> Separate buildings that house gaseous hydrogen systems must be constructed according to specific requirements (29 CFR 1910.103(b)(3)(ii)(a)).	<p>Verify that buildings are of noncombustible construction.</p> <p>Verify that windows and doors are readily accessible in the event of an emergency.</p> <p>Verify that windows are constructed of glass or plastic in metal frames.</p>
<b>HZ.20.19.</b> Adequate ventilation to the outdoors must be provided in buildings that house gaseous hydrogen systems (29 CFR 1910.103(b)(3) (ii)(b)).	<p>Verify that inlet openings are located near the floor in exterior walls only.</p> <p>Verify that outlet openings are located at the high point of the room in exterior walls or the roof.</p> <p>Verify that inlet and outlet openings each have minimum total areas of 1 ft<sup>2</sup> per 1000 ft<sup>3</sup> of room volume.</p> <p>Verify that discharge from outlet openings is directed or conducted to a safe location.</p>
<b>HZ.20.20.</b> Explosion venting must be provided only in the exterior walls and roof of buildings that house gaseous hydrogen systems (29 CFR 1910.103(b)(3)(ii)(c)).	<p>Verify that exterior walls and roofs have explosion venting.</p> <p>Verify that the venting area is at least 1 ft<sup>2</sup> per 1000 ft<sup>3</sup> of room volume.</p> <p>(NOTE: The venting area may consist of any one or combination of the following:</p> <ul style="list-style-type: none"> <li>- walls of light, noncombustible material, preferably single-thickness, single-strength glass</li> <li>- lightly fastened hatch covers</li> <li>- lightly fastened swinging doors opening outward in exterior walls</li> <li>- lightly fastened walls or roof designed to relieve at a maximum pressure of 25 lb/ft<sup>2</sup>.)</li> </ul>
<b>HZ.20.21.</b> Sources of ignition are prohibited in buildings that house gaseous hydrogen systems (29 CFR 1910.103(b)(3) (ii)(d)).	<p>Verify that there are no sources of ignition from open flames, electrical equipment, or heating equipment in any building that houses a gaseous hydrogen system.</p>

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<b>HZ.20.22.</b> Electrical equipment in buildings that house gaseous hydrogen systems must meet specific requirements (29 CFR 1910.103(b)(3) (ii)(e)).	Verify that electrical equipment meets the requirements of 29 CFR 1910, subpart S for Class I, Division 2 locations.
<b>HZ.20.23.</b> Heating in buildings that house gaseous hydrogen systems must meet specific requirements (29 CFR 1910.103(b)(3)(ii)(f)).	Verify that, if provided, heating is of steam, hot water, or other indirect means.
<b>HZ.20.24.</b> Special rooms for housing gaseous hydrogen systems must be constructed according to specific requirements (29 CFR 1910.103(b)(3) (iii)(a)).	<p>Verify that floors, walls, and ceilings have a fire-resistance rating of at least 2 hours.</p> <p>Verify that walls or partitions are continuous from floor to ceiling and are securely anchored.</p> <p>Verify that at least one wall is an exterior wall.</p> <p>Verify that there are no openings to other parts of the building.</p> <p>Verify that windows and doors are in exterior walls and are readily accessible in the event of an emergency.</p> <p>Verify that windows are constructed of glass or plastic in metal frames.</p>
<b>HZ.20.25.</b> Adequate ventilation must be provided in special rooms that house gaseous hydrogen systems (29 CFR 1910.103(b)(3)(iii)(b)).	Verify that ventilation meets the requirements for separate buildings in 29 CFR 1910.103(b)(3)(ii)(b) (see checklist item HZ.20.19).
<b>HZ.20.26.</b> Explosion venting must be provided for special rooms that house gaseous hydrogen systems (29 CFR 1910.103(b)(3)(iii)(c)).	Verify that explosion venting meets the requirements for separate buildings in 29 CFR 1910.103(b)(3)(ii)(c) (see checklist item HZ.20.20).
<b>HZ.20.27.</b> Sources of ignition are prohibited in special rooms that house gaseous hydrogen systems (29 CFR 1910.103(b)(3) (iii)(d)).	Verify that there are no sources of ignition from open flames, electrical equipment, or heating equipment in special rooms that house gaseous hydrogen systems.

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<b>HZ.20.28.</b> Electrical equipment in special rooms that house gaseous hydrogen systems must meet specific requirements (29 CFR 1910.103(b)(3) (iii)(e)).	Verify that electrical equipment meets the requirements of 29 CFR 1910, subpart S for Class I, Division 2 locations.
<b>HZ.20.29.</b> Installations must maintain legible instructions for equipment operation (29 CFR 1910.103(b)(4)).	Verify that the installation provides legible instructions at locations where users may be operating equipment.
<b>HZ.20.30.</b> Installations must maintain charged gaseous hydrogen systems in a safe operating condition (29 CFR 1910.103(b)(5)).	Verify that the installation maintains the equipment and functioning of each charged gaseous hydrogen system in a safe operating condition in accordance with the requirements of 29 CFR 1910.103.  Verify that the area within 15 ft of any hydrogen container is free of dry vegetation and combustible material.

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<p><b>HYDROGEN</b></p> <p><b>HZ.30</b> <b>Liquefied Hydrogen Systems</b></p> <p><b>HZ.30.1.</b> Permanently installed hydrogen containers must be adequately supported (29 CFR 1910.103(c)(1)(ii)).</p> <p><b>HZ.30.2.</b> Liquefied hydrogen containers must be marked (29 CFR 1910.103(c)(1)(iii)).</p> <p><b>HZ.30.3.</b> Liquefied hydrogen containers must be equipped with safety devices (29 CFR 1910.103(c)(1)(iv)(a)(1) and 1910.103(c)(1)(iv)(a)(2)).</p> <p><b>HZ.30.4.</b> Safety relief devices for liquefied hydrogen containers must meet specific requirements (29 CFR 1910.103(c)(1)(iv)(b) through 1910.103(c)(1)(iv)(d)).</p> <p><b>HZ.30.5.</b> Piping, tubing, and fittings and gasket and thread sealants must be suitable for hydrogen service at the pressures and temperatures involved (29 CFR</p>	<p>(NOTE: These checklist items in HZ.20 do not apply to liquefied hydrogen portable containers of less than 150 L (39.63 gal) capacity.)</p> <p>Verify that containers are provided with substantial noncombustible supports on firm noncombustible foundations.</p> <p>Verify that supports more than 18 in. high have a protective coating with a 2-h fire-resistance rating.</p> <p>Verify that each liquefied hydrogen container is marked legibly LIQUEFIED HYDROGEN -- FLAMMABLE GAS.</p> <p>Verify that stationary liquefied hydrogen containers are equipped with safety relief devices.</p> <p>Verify that portable liquefied hydrogen containers meeting DOT Regulations are equipped with safety devices as required in DOT Specifications and Regulations.</p> <p>Verify that safety relief devices are arranged to discharge unobstructed to the outdoors and in a manner that prevents any impingement of escaping gas upon the container, adjacent structures, or personnel.</p> <p>(NOTE: The requirements of 29 CFR 1910.103(c)(2)(i)(f) (see checklist item HZ.30.18) address the proper venting of safety relief devices in special locations.)</p> <p>Verify that safety relief devices or vent piping are designed or located so that moisture cannot collect and freeze in a manner that might interfere with proper operation of the device.</p> <p>Verify that safety relief devices are provided in piping wherever liquefied hydrogen could be trapped between closures.</p> <p>Verify that piping, tubing, fittings, and gasket and thread sealants are suitable for hydrogen service at the pressures and temperatures involved and that consideration has been given to the thermal expansion and contraction of piping systems when exposed to temperature fluctuations of ambient to liquefied hydrogen temperatures.</p>

<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>SAFETY: HAZARDOUS MATERIALS</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
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<p>1910.103(c)(1)(v)(a)).</p> <p><b>HZ.30.6.</b> Piping and tubing joints must meet specific requirements (29 CFR 1910.103(c)(1)(v)(c)).</p> <p><b>HZ.30.7.</b> Installations must provide means for minimizing the exposure of its personnel to piping operating at low temperatures and for preventing air condensate from contacting piping, structural members, and surfaces not suitable for cryogenic temperatures (29 CFR 1910.103(c)(1)(v)(d)).</p> <p><b>HZ.30.8.</b> Uninsulated piping and equipment that operate at liquefied hydrogen temperature must meet specific requirements (29 CFR 1910.103(c)(1)(v)(e)).</p> <p><b>HZ.30.9.</b> Valves, gauges, regulators, and other accessories must meet specific requirements (29 CFR 1910.103(c)(1)(vi)(a), 1910.103(c)(1)(vi)(b), and 1910.103(c)(1)(vi)(d)).</p> <p><b>HZ.30.10.</b> Storage containers, piping, valves, regulating equipment, and other accessories must be readily accessible and protected against physical damage and tampering (29 CFR 1910.103(c)(1)(vi)(c)).</p>	<p>Verify that joints in piping and tubing are made by welding or brazing. (NOTE: Flanged, threaded, socket, or suitable compression fittings may be used.)</p> <p>Verify that the installation uses only those insulating materials that are rated <i>non-burning</i>.  Verify that insulation has a vapor-tight seal in the outer covering.  Verify that the insulation and outside shield are of adequate design to prevent attrition of the insulation due to normal operating conditions.</p> <p>Verify that uninsulated piping and equipment that operate at liquefied hydrogen temperature are not installed above asphalt surfaces or other combustible materials. (NOTE: Drip pans may be installed under uninsulated piping and equipment to retain and vaporize condensed liquid air.)</p> <p>Verify that valves, gauges, regulators, and other accessories are suitable for hydrogen service and for the pressures and temperatures involved.  Verify that the installation of liquefied hydrogen systems is supervised by personnel familiar with proper practices and with reference to their construction and use.  Verify that cabinets or housings containing hydrogen control or operating equipment are ventilated to prevent accumulation of hydrogen gas.</p> <p>Verify that storage containers, piping, valves, regulating equipment, and other accessories are readily accessible and protected against physical damage and tampering.  Verify that a shutoff valve is located in liquid product withdrawal lines as close to the container as is practicable.  Verify that, on containers of over 2000-gal capacity, the shutoff valve is of the remote control type with no connections, flanges, or other appurtenances (other than a welded manual shutoff valve) in the piping between the shutoff valve and</p>

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<p><b>HZ.30.11.</b> Liquefied hydrogen equipment must be tested and inspected (29 CFR 1910.103(c)(1)(vii)).</p> <p><b>HZ.30.12.</b> Liquefied hydrogen vaporizers must meet specific requirements (29 CFR 1910.103(c)(1)(viii)).</p> <p><b>HZ.30.13.</b> Electrical wiring and equipment must meet specific requirements (29 CFR 1910.103(c)(1)(ix)).</p> <p><b>HZ.30.14.</b> Liquefied hydrogen containers must be electrically bonded and grounded (29 CFR 1910.103(c)(1)(x)).</p>	<p>its connection to the inner container.</p> <p>Verify that, after installation, all field-erected piping is tested and proved hydrogen gas-tight at operating pressure and temperature.</p> <p>Verify that the installation inspects and tests (as above) those containers that are out of service for more than 1 yr.</p> <p>Verify that the installation checks safety relief devices to determine if they are operable and properly set.</p> <p>Verify that vaporizers are anchored and their connecting piping is sufficiently flexible to provide for expansion and contraction due to temperature changes.</p> <p>Verify that vaporizers and their piping are adequately protected with safety relief devices on the hydrogen and heating media sections.</p> <p>Verify that heat used in a liquefied hydrogen vaporizer is indirectly supplied using media such as air, steam, water, or water solutions.</p> <p>Verify that vaporizer discharge piping has a low-temperature shutoff switch to prevent flow of liquefied hydrogen if the heat source is lost.</p> <p>(NOTE: This requirement does not apply to electrical equipment installed on mobile supply trucks or tank cars from which the storage container is filled.)</p> <p>Verify that electrical wiring and equipment located within 3 ft of a point where connections are regularly made and disconnected meet the requirements of 29 CFR 1910, subpart S for Class I, Group B, Division 1 locations.</p> <p>Verify that, except as provided above, electrical wiring and equipment located within 25 ft of a point where connections are regularly made and disconnected or within 25 ft of a liquid hydrogen storage container meet the requirements of 29 CFR 1910, subpart S for Class I, Group B, Division 2 locations.</p> <p>(NOTE: When equipment approved for Class I, Group B atmospheres is not commercially available, the equipment may be:</p> <ul style="list-style-type: none"> <li>- purged or ventilated in accordance with NFPA No. 496-1967, Standard for Purged Enclosures for Electrical Equipment in Hazardous Locations</li> <li>- intrinsically safe</li> <li>- approved for Class I, Group C atmospheres.)</li> </ul> <p>Verify that liquefied hydrogen containers are electrically bonded and grounded.</p>

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<p><b>HZ.30.15.</b> The siting of liquefied hydrogen storage containers must meet specific requirements (29 CFR 1910.103(c)(2)(i)(a) and 1910.103(c)(2)(i)(b)).</p>	<p>Verify that storage containers are readily accessible to authorized personnel and to mobile supply equipment at ground level.</p> <p>Verify that storage containers are not exposed by electric power lines, flammable liquid lines, flammable gas lines, or lines carrying oxidizing materials.</p>
<p><b>HZ.30.16.</b> Installations must take suitable protective measures with respect to flammable liquid storage or liquid oxygen storage adjacent to liquefied hydrogen storage containers (29 CFR 1910.103(c)(2)(i)(c) and 1910.103(c)(2)(i)(d)).</p>	<p>Verify that, where liquefied hydrogen storage containers are located on ground that is level with, or lower than, adjacent flammable liquid storage or liquid oxygen storage, suitable protective measures have been taken (such as by diking, diversion curbs, grading, etc.) in respect to the flammable liquid storage or liquid oxygen storage to prevent accumulation of liquids within 50 ft of the liquefied hydrogen container.</p> <p>(NOTE: Where liquefied hydrogen storage containers are located near above-ground flammable liquid storage or liquid oxygen storage, it is advisable to locate the liquefied hydrogen storage container on ground higher than the flammable liquid or liquid oxygen storage.)</p>
<p><b>HZ.30.17.</b> Liquefied hydrogen storage sites must be fenced and posted (29 CFR 1910.103(c)(2) (i)(e)).</p>	<p>Verify that storage sites are fenced and posted to prevent entrance by unauthorized personnel.</p> <p>Verify that storage sites are placarded as follows: LIQUEFIED HYDROGEN -- FLAMMABLE GAS -- NO SMOKING -- NO OPEN FLAMES.</p>
<p><b>HZ.30.18.</b> Liquefied hydrogen containers located in a separate building, a special room, or inside buildings when not in a special room and exposed to other occupancies must have adequately vented safety relief devices (29 CFR 1910.103(c)(2) (i)(f)).</p>	<p>Verify that the safety relief devices for such liquefied hydrogen containers are vented unobstructed to the outdoors at a minimum elevation of 25 ft above grade to a safe location as specified under 29 CFR 1910.103(c)(1)(iv)(b) (see checklist item HZ.30.4).</p>
<p><b>HZ.30.19.</b> The location of liquefied hydrogen storage must be in the order of preference determined by the maximum total quantity of hydrogen (29 CFR 1910.103(c)(2) (ii)(a)).</p>	<p>Verify that liquefied hydrogen storage is located according the order of preference outlined in Appendix 43-3.</p>
<p><b>HZ.30.20.</b> Liquefied hydrogen systems must be located a minimum distance from</p>	<p>Verify that liquefied hydrogen systems located outdoors, in separate buildings, or in special rooms are kept a minimum distance in feet from specified outdoor ex-</p>

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<p>specified outdoor exposure (29 CFR 1910.103(c)(2)(ii)(b)).</p> <p><b>HZ.30.21.</b> Portable liquefied hydrogen containers of 50 gal or less capacity that are housed inside buildings not located in a special room and exposed to other occupancies must meet specific requirements (29 CFR 1910.103(c)(2)(iii)).</p> <p><b>HZ.30.22.</b> Outdoor locations for liquefied hydrogen systems must meet specific requirements (29 CFR 1910.103(c)(3)(i)(b) through 1910.103(c)(3)(i)(e)).</p> <p><b>HZ.30.23.</b> Separate buildings that house liquefied hydrogen systems must be constructed according to specific requirements (29 CFR</p>	<p>posure, as outlined in Appendix 43-4.</p> <p>Verify that portable liquefied hydrogen containers of 50 gal or less capacity that are housed inside buildings not located in a special room and exposed to other occupancies are located:</p> <ul style="list-style-type: none"> <li>- 20 ft from flammable liquids and readily combustible materials such as excelsior or paper</li> <li>- 25 ft from ordinary electrical equipment and other sources of ignition including process or analytical equipment</li> <li>- 25 ft from concentrations of people</li> <li>- 50 ft from intakes of ventilation and air-conditioning equipment or intakes of compressors</li> <li>- 50 ft from storage of other flammable gases or storage of oxidizing gases.</li> </ul> <p>Verify that containers are protected against damage or injury due to falling objects or work activity in the area.</p> <p>Verify that containers are firmly secured and stored in an upright position.</p> <p>Verify that welding or cutting operations and smoking are prohibited while hydrogen is in the room.</p> <p>Verify that the area is adequately ventilated and that safety relief devices on the containers are vented directly outdoors or to a suitable hood, as outlined in 29 CFR 1910.103(c)(1)(iv)(b) and 1910.103(c)(2)(i)(f) (see checklist items HZ.30.4 and HZ.30.18).</p> <p>Verify that roadways and yard surfaces located below liquefied hydrogen piping from which liquid air may drip are constructed of noncombustible materials.</p> <p>Verify that, if protective walls are provided, they are constructed of noncombustible materials and in accordance with the definition of <i>outdoor locations</i>.</p> <p>Verify that electrical wiring and equipment meet the requirements of 29 CFR 1910.103(c)(1)(ix) (see checklist item HZ.30.13).</p> <p>Verify that the installation provides adequate lighting for nighttime transfer operations.</p> <p>Verify that buildings are of light, noncombustible construction on a substantial frame.</p> <p>Verify that walls and roofs are lightly fastened and designed to relieve at a</p>

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<p>1910.103(c)(3)(ii)(a)).</p> <p><b>HZ.30.24.</b> Adequate ventilation to the outdoors must be provided in buildings that house liquefied hydrogen systems (29 CFR 1910.103(c)(3)(ii)(b)).</p> <p><b>HZ.30.25.</b> Sources of ignition are prohibited in buildings that house liquefied hydrogen systems (29 CFR 1910.103(c)(3)(ii)(c)).</p> <p><b>HZ.30.26.</b> Electrical wiring and equipment in buildings that house liquefied hydrogen systems must meet specific requirements (29 CFR 1910.103(c)(3)(ii)(d)).</p> <p><b>HZ.30.27.</b> Heating in separate buildings that house liquefied hydrogen systems must meet specific requirements (29 CFR 1910.103(c)(3)(ii)(e)).</p> <p><b>HZ.30.28.</b> Special rooms for housing liquefied hydrogen systems must be constructed according to specific requirements (29 CFR 1910.103(c)(3)(iii)(a)).</p>	<p>maximum internal pressure of 25 lb/ft<sup>2</sup>.</p> <p>Verify that windows are constructed of shatterproof glass or plastic in metal frames.</p> <p>Verify that doors are readily accessible to personnel in the event of an emergency.</p> <p>Verify that inlet openings are located near floor level in exterior walls only.</p> <p>Verify that outlet openings are located at the high point of the room in exterior walls or the roof.</p> <p>Verify that inlet and outlet openings each have minimum total areas of 1 ft<sup>2</sup> per 1000 ft<sup>3</sup> of room volume.</p> <p>Verify that discharge from outlet openings is directed or conducted to a safe location.</p> <p>Verify that there are no sources of ignition in separate buildings that house liquefied hydrogen systems.</p> <p>Verify that electrical wiring and equipment meet the requirements of 29 CFR 1910.103(c)(1)(ix)(a) and 1910.103(c)(1)(ix)(b) (see checklist item HZ.30.13).</p> <p>(NOTE: Under this requirement, the provisions of 29 CFR 1910.103(c)(1)(ix)(b) apply to all electrical wiring and equipment in the separate building.)</p> <p>Verify that, if provided, heating is of steam, hot water, or other indirect means.</p> <p>Verify that floors, walls, and ceilings have a fire-resistance rating of at least 2 h.</p> <p>Verify that walls or partitions are continuous from floor to ceiling and are securely anchored.</p> <p>Verify that at least one wall is an exterior wall.</p>

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<p><b>HZ.30.29.</b> Adequate ventilation must be provided in special rooms that house liquefied hydrogen systems (29 CFR 1910.103(c)(3)(iii)(b)).</p> <p><b>HZ.30.30.</b> Explosion venting must be provided only in the exterior walls and roof of special rooms that house liquefied hydrogen systems (29 CFR 1910.103(c)(3)(iii)(c)).</p> <p><b>HZ.30.31.</b> Sources of ignition are prohibited in special rooms that house gaseous hydrogen systems (29 CFR 1910.103(c)(3)(iii)(d)).</p> <p><b>HZ.30.32.</b> Electrical wiring and equipment in special rooms that house gaseous hydrogen systems must meet specific requirements (29 CFR 1910.103(c)(3)(iii)(e)).</p> <p><b>HZ.30.33.</b> Heating in special rooms that house liquefied hydrogen systems must meet specific requirements (29 CFR 1910.103(c)(3)(iii)(f)).</p>	<p>Verify that there are no openings to other parts of the building.</p> <p>Verify that windows and doors are in exterior walls and are readily accessible in the event of an emergency.</p> <p>Verify that windows are constructed of shatterproof glass or plastic in metal frames.</p> <p>Verify that ventilation meets the requirements for separate buildings in 29 CFR 1910.103(c)(3)(ii)(b) (see checklist item HZ.30.24).</p> <p>Verify that explosion venting is provided only in the exterior walls and roof in special rooms.</p> <p>Verify that the venting area is not less than 1 ft<sup>2</sup> per 30 ft<sup>3</sup> of room volume.</p> <p>(NOTE: The venting area may consist of any one or combination of the following:</p> <ul style="list-style-type: none"> <li>- walls of light, noncombustible material</li> <li>- lightly fastened hatch covers</li> <li>- lightly fastened swinging doors opening outward in exterior walls</li> <li>- lightly fastened walls or roof designed to relieve at a maximum pressure of 25 lb/ft<sup>2</sup>.)</li> </ul> <p>Verify that there are no sources of ignition in special rooms that house gaseous hydrogen systems.</p> <p>Verify that electrical wiring and equipment meet the requirements of 29 CFR 1910(c)(1)(ix)(a) and 1910.103(c)(1)(ix)(b) (see checklist item HZ.30.13).</p> <p>(NOTE: Under this requirement, the provisions of 29 CFR 1910.103(c)(1)(ix)(b) apply to all electrical wiring and equipment in the special room.)</p> <p>Verify that, if provided, heating is of steam, hot water, or other indirect means.</p>

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<b>HZ.30.34.</b> Installations must maintain legible instructions for equipment operation (29 CFR 1910.103(c)(4)(i)).	Verify that the installation provides legible instructions at locations where users may be operating equipment.
<b>HZ.30.35.</b> Mobile hydrogen supply units must meet specific requirements (29 CFR 1910.103(c)(4)(ii) through 1910.103(c)(4)(iv)).	Verify that a qualified person is in attendance at all times while a mobile hydrogen supply unit is being unloaded.  Verify that each mobile liquefied hydrogen supply unit used as part of a hydrogen system is adequately secured to prevent movement.
<b>HZ.30.36.</b> Installations must maintain charged liquefied hydrogen systems in a safe operating condition (29 CFR 1910.103(c)(5)).	Verify that each mobile liquefied hydrogen supply unit is grounded for static electricity.  Verify that the installation maintains the equipment and functioning of each charged liquefied hydrogen system in a safe operating condition.  Verify that the area within 25 ft of any charged liquefied hydrogen equipment is free of weeds or similar combustibles.

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<p><b>HZ.40 OXYGEN</b></p> <p><b>HZ.40.1.</b> The siting of bulk oxygen systems must meet specific requirements (29 CFR 1910.104(b)(2)(i) and 1910.104(b)(2)(ii)).</p> <p><b>HZ.40.2.</b> Where oxygen is stored as a liquid, installations must provide noncombustible surfacing in specific areas (29 CFR 1910.104(b)(2)(iii)).</p> <p><b>HZ.40.3.</b> Installations must take suitable protective measures with respect to flammable or combustible liquid storage adjacent to bulk oxygen systems (29 CFR 1910.104(b)(2)(iv) and 1910.104(b)(2)(v)).</p> <p><b>HZ.40.4.</b> Bulk oxygen systems must be a minimum distance from combustible structures (29 CFR 1910.104(b)(3)(ii)).</p>	<p>(NOTE: 29 CFR 1910.104 (see the checklist items in HZ.40) applies to the installation of <i>bulk oxygen systems</i> on industrial and institutional consumer premises. It does not cover systems with a storage capacity of less than 13,000 ft<sup>3</sup> of oxygen (NTP) or those with less than 25,000 ft<sup>3</sup> of oxygen (NTP) including unconnected reserves onhand at the installation.)</p> <p>(NOTE: Except where indicated, the distance between any bulk oxygen system and exposures is measured using the most direct line.)</p> <p>Verify that bulk oxygen storage systems are either located above ground outdoors or installed in a building of noncombustible construction.</p> <p>Verify that, if bulk oxygen storage systems are installed in a building, the building is adequately vented and used exclusively for housing the system.</p> <p>Verify that bulk oxygen storage containers are not exposed by electric power lines, flammable or combustible liquid lines, or flammable gas lines.</p> <p>Verify that bulk oxygen storage systems are accessible to authorized personnel and to mobile supply equipment at ground level.</p> <p>Verify that, where oxygen is stored as a liquid, noncombustible surfacing is provided in any area in which leakage of liquid oxygen might occur during operation of the system and filling of a storage container.</p> <p>(NOTE: For the purposes of this requirement, asphaltic or bituminous paving is considered to be combustible.)</p> <p>Verify that, where bulk oxygen systems are located on ground that is lower than adjacent flammable or combustible liquid storage, suitable protective measures have been taken (such as by diking, diversion curbs, grading, etc.) in respect to the flammable or combustible liquid storage to prevent accumulation of liquids under the bulk oxygen systems.</p> <p>(NOTE: When locating bulk oxygen storage systems near aboveground flammable or combustible liquid storage, which may be either indoors or outdoors, it is advisable to locate the system on ground higher than the flammable or combustible liquid storage.)</p> <p>Verify that bulk oxygen systems are 50 ft from any combustible structures.</p>

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	<p>(NOTE: This distance does not apply when protective structures, such as firewalls of adequate height to safeguard the oxygen storage systems, are located between the bulk oxygen storage installation and the structure. In such cases, the bulk oxygen storage may be a minimum distance of 1 ft from the firewall or protective structure.)</p>
<p><b>HZ.40.5.</b> Bulk oxygen systems must be a minimum distance from fire-resistant structures (29 CFR 1910.104(b)(3)(iii) and 1910.104(b)(3)(iv)).</p>	<p>Verify that bulk oxygen systems are 25 ft from any structures with fire-resistant exterior walls or sprinklered buildings of other construction, but not less than one-half the height of adjacent side walls of the structure.</p> <p>(NOTE: This distance does not apply when protective structures, such as firewalls of adequate height to safeguard the oxygen storage systems, are located between the bulk oxygen storage installation and the structure. In such cases, the bulk oxygen storage may be a minimum distance of 1 ft from the firewall or protective structure.)</p> <p>Verify that bulk oxygen systems are at least 10 ft from any opening in adjacent walls of fire-resistant structures and that spacing is adequate to permit maintenance, but is not less than 1 ft.</p>
<p><b>HZ.40.6.</b> Bulk oxygen systems must be a minimum distance from aboveground flammable liquid storage (29 CFR 1910.104(b)(3)(v)).</p>	<p>Verify that bulk oxygen systems meet the minimum distances from aboveground flammable liquid storage specified in Appendix 43-5.</p>
<p><b>HZ.40.7.</b> Bulk oxygen systems must be a minimum distance from belowground flammable liquid storage (29 CFR 1910.104(b)(3)(vi)).</p>	<p>Verify that bulk oxygen systems meet the minimum distances from belowground flammable liquid storage specified in Appendix 43-5.</p>
<p><b>HZ.40.8.</b> Bulk oxygen systems must be a minimum distance from aboveground combustible liquid storage (29 CFR 1910.104(b)(3)(vii)).</p>	<p>Verify that bulk oxygen systems meet the minimum distances from aboveground combustible liquid storage specified in Appendix 43-5.</p>
<p><b>HZ.40.9.</b> Bulk oxygen systems must be a minimum distance from belowground combustible liquid storage (29 CFR 1910.104(b)(3)(viii)).</p>	<p>Verify that bulk oxygen systems meet the minimum distances from belowground combustible liquid storage specified in Appendix 43-5.</p>

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<b>HZ.40.10.</b> Bulk oxygen systems must be a minimum distance from flammable gas storage (29 CFR 1910.104(b)(3)(ix)).	Verify that bulk oxygen systems meet the minimum distances from flammable gas storage specified in Appendix 43-5.  (NOTE: Flammable gas storage in this instance includes, but is not limited to, compressed flammable gases, liquefied flammable gases, and liquefied flammable gases in low-pressure holders.)
<b>HZ.40.11.</b> Bulk oxygen systems must be a minimum distance from highly combustible materials (29 CFR 1910.104(b)(3)(x)).	Verify that bulk oxygen systems are 50 ft from highly combustible solid materials such as excelsior or paper.  (NOTE: This distance does not apply when protective structures, such as firewalls of adequate height to safeguard the oxygen storage systems, are located between the bulk oxygen storage installation and the material(s). In such cases, the bulk oxygen storage may be a minimum distance of 1 ft from the firewall or protective structure.)
<b>HZ.40.12.</b> Bulk oxygen systems must be a minimum distance from slow-burning solid materials (29 CFR 1910.104(b)(3)(xi)).	Verify that bulk oxygen systems are 25 ft from slow-burning solid materials such as coal and heavy timber.  (NOTE: This distance does not apply when protective structures, such as firewalls of adequate height to safeguard the oxygen storage systems, are located between the bulk oxygen storage installation and the material(s). In such cases, the bulk oxygen storage may be a minimum distance of 1 ft from the firewall or protective structure.)
<b>HZ.40.13.</b> Bulk oxygen systems must be a minimum distance from confining walls (29 CFR 1910.104(b)(3)(xii)).	Verify that bulk oxygen systems are 75 ft in one direction and 35 ft in approximately 90° direction from confining walls to provide adequate ventilation in courtyards and similar confining areas.  (NOTE: This does not apply to firewalls less than 20 ft high.)
<b>HZ.40.14.</b> Bulk oxygen systems must be a minimum distance from congested areas (29 CFR 1910.104(b)(3)(xiii)).	Verify that bulk oxygen systems are 25 ft from congested areas such as offices, lunchrooms, locker rooms, time clock areas, and similar locations where people may congregate.
<b>HZ.40.15.</b> Permanently installed containers must have adequate foundations and supports (29 CFR 1910.104(b)(4)(i)).	Verify that permanently installed storage containers have substantial noncombustible supports on firm noncombustible foundations.

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<b>HZ.40.16.</b> Liquid oxygen storage containers must meet specific construction, design, and test-ing requirements (29 CFR 1910.104(b)(4)(ii)).	Verify that the insulation surrounding liquid oxygen storage containers is non-combustible.
<b>HZ.40.17.</b> Piping, tubing, and fittings must be suitable for oxygen service and for the pressures and temperatures involved (29 CFR 1910.104(b)(5)(i)).	Verify that piping and fittings are suitable for oxygen service and the pressure and temperatures involved.
<b>HZ.40.18.</b> Bulk oxygen storage containers must be equipped with safety relief devices (29 CFR 1910.104(b)(6)(i) through 1910.104(b)(6)(iv)).	<p>Verify that bulk oxygen containers designed and constructed in accordance with DOT Specifications are equipped with safety devices.</p> <p>Verify that bulk oxygen containers designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, <i>Unfired Pressure Vessels</i>, 1968 are equipped with safety relief devices.</p> <p>Verify that the insulation casings on liquid oxygen containers are equipped with suitable safety relief devices.</p>
<b>HZ.40.19.</b> Safety relief devices must be adequately designed or located (29 CFR 1910.104(b) (6)(v)).	Verify that all safety relief devices are designed or located so that moisture cannot collect and freeze in a manner that would interfere with the proper operation of the device.
<b>HZ.40.20.</b> Liquid oxygen vaporizers must meet specific requirements (29 CFR 1910.104(b)(7)(i) through 1910.104(b) (7)(iv)).	<p>Verify that vaporizers are anchored and their connecting points sufficiently flexible to provide for expansion and contraction due to temperature changes.</p> <p>Verify that vaporizers and their piping are adequately protected on the oxygen and heating medium sections with safety relief devices.</p> <p>Verify that heat used in an oxygen vaporizer is indirectly supplied using only such media as air, steam, water, or water solutions that do not react with oxygen.</p> <p>Verify that, if electric heaters are used as the primary heat source, the vaporizing system is grounded.</p>
<b>HZ.40.21.</b> The equipment in a bulk oxygen system must be cleaned prior to service (29 CFR 1910.104(b)(8)(i)).	Verify that the installation cleans the equipment that compose a bulk oxygen system to remove oil, grease, or other readily oxidizable materials before placing the system into service.

**COMPLIANCE CATEGORY:**  
**SAFETY: HAZARDOUS MATERIALS**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>HZ.40.22.</b> Joints and valves, gauges, regulators, and other accessories must be suitable for oxygen service (29 CFR 1910.104(b)(8)(ii) and 1910.104(b)(8)(iii)).	Verify that gaskets or thread sealants are suitable for oxygen service.  (NOTE: Joints in piping and tubing may be made by welding or by use of flanged, threaded, slip, or compression fittings.)  Verify that valves, gauges, regulators, and other accessories are suitable for oxygen service.
<b>HZ.40.23.</b> Bulk oxygen systems must be installed and tested according to specific requirements (29 CFR 1910.104(b)(8)(iv) and 1910.104(b)(8)(v)).	Verify that the installation of oxygen systems is supervised by personnel familiar with the proper practices for their construction and use.  Verify that, after installation, all field-erected piping is tested using an oil-free, nonflammable medium and proved gas-tight at maximum operating pressure.
<b>HZ.40.24.</b> Bulk oxygen systems must be adequately protected (29 CFR 1910.104(b)(8)(vi)).	Verify that storage containers, piping, valves, regulating equipment, and other accessories are protected against physical damage and tampering.
<b>HZ.40.25.</b> Enclosures containing oxygen system equipment must be adequately vented (29 CFR 1910.104(b)(8)(vii)).	Verify that enclosures containing oxygen control or operating equipment are adequately vented.
<b>HZ.40.26.</b> Bulk oxygen storage locations must be permanently placarded (29 CFR 1910.104(b)(8)(ix)).	Verify that bulk oxygen storage locations are permanently placarded to indicate OXYGEN--NO SMOKING--NO OPEN FLAMES or a similar warning.
<b>HZ.40.27.</b> Electrical wiring and equipment must be installed according to specific guidelines (29 CFR 1910.104(b)(8)(x)).	Verify that electrical wiring and equipment are installed in accordance with the applicable provisions of 29 CFR 1910, subpart S.  (NOTE: Bulk oxygen installations are not hazardous locations as defined and covered in 29 CFR 1910, subpart S. Therefore, general purpose or weatherproof types of electrical wiring and equipment are acceptable depending upon whether the installation is indoors or outdoors.)
<b>HZ.40.28.</b> Installations must maintain legible instructions for equipment operation (29 CFR 1910.104(b)(9)).	Verify that the installation provides legible instructions at locations where users may be operating equipment.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>HZ.40.29.</b> Installations must maintain charged bulk oxygen systems in a safe operating condition (29 CFR 1910.104(b)(10)).	Verify that the installation maintains the equipment and functioning of each charged bulk oxygen system in a safe operating condition in accordance with the requirements of this chapter.  Verify that wood and long dry grass are cut back within 15 ft of any bulk oxygen storage container.

**COMPLIANCE CATEGORY:**  
**SAFETY: HAZARDOUS MATERIALS**  
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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>HZ.50</b> <b>NITROUS OXIDE</b></p> <p><b>HZ.50.1.</b> Piped systems for the inplant transfer and distribution of NO must be designed, installed, maintained, and operated according to specific requirements (29 CFR 1910.105).</p>	<p>Verify that piped systems for the inplant transfer and distribution of NO are designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G-8.1-1964.</p>



# Appendix 43-1

## Minimum Distance in Feet from a Hydrogen System to Any Specified Outdoor Enclosure (29 CFR 1910.103, Table H-2)

Type of outdoor exposure		Size of hydrogen system		
		Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
1. Building or structure	Wood frame construction <sup>1</sup>	10	25	50
	Heavy timber, noncombustible or ordinary construction <sup>1</sup>	0	10	25 <sup>2</sup>
	Fire-resistive construction <sup>1</sup>	0	0	0
2. Wall openings	Not above any part of a system	10	10	10
	Above any part of a system	25	25	25
3. Flammable liquids above ground	0 to 1,000 gallons	10	25	25
	In excess of 1,000 gallons	25	50	50
4. Flammable liquids below ground -- 0 to 1,000 gallons	Tank	10	10	10
	Vent or fill opening	25	25	25
5. Flammable liquids below ground -- in excess of 1,000 gallons	Tank	20	20	20
	Vent or fill opening	25	25	25
6. Flammable gas storage, either high pressure or low pressure	0 to 15,000 CF capacity	10	25	25
	In excess of 15,000 CF capacity	25	50	50
7. Oxygen storage	12,000 CF or less <sup>4</sup>	.....	.....	.....
	More than 12,000 CF <sup>5</sup>	.....	.....	.....
8. Fast burning solids such as ordinary lumber, excelsior or paper		50	50	50
9. Slow burning solids such as heavy timber or coal		25	25	25
10. Open flames and other sources of ignition		25	25	25
11. Air compressor intakes or inlets to ventilating or air-conditioning equipment		50	50	50
12. Concentration of people <sup>3</sup>		25	50	50

NOTE: The distances in Items 1 and 3 to 10 inclusive do not apply where protective structures such as adequate fire walls are located between the system and the exposure.

<sup>1</sup> Refer to NFPA No. 220 *Standard Types of Building Construction* for definitions of various types of construction. (1969 Ed.)

<sup>2</sup> But not less than one-half the height of adjacent side wall of the structure.

<sup>3</sup> In congested areas such as offices, lunchrooms, locker rooms, time-clock areas.

<sup>4</sup> Refer to NFPA No. 51, *Gas Systems for Welding and Cutting* (1969).

<sup>5</sup> Refer to NFPA No. 566, *Bulk Oxygen Systems at Consumer Sites* (1969).

## Appendix 43-2

### Order of Preference for Location of a Hydrogen System (29 CFR 1910.103, Table H-1)

Nature of Location	Size of hydrogen system		
	Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
Outdoors	I	I	I
In a separate building	II	II	II
In a special room	III	III	Not permitted
Inside buildings not in a special room and exposed to other occupancies	IV	Not permitted	Not permitted





### Appendix 43-3

#### Maximum Total Quantity of Liquefied Hydrogen Storage Permitted (29 CFR 1910.103, Table H-3)

Nature of location	Size of hydrogen storage (capacity in gallons)			
	39.63 (150 liters) to 50	51 to 300	301 to 600	In excess of 600
Outdoors	I	I	I	I
In a separate building	II	II	II	Not permitted
In a special room	III	III	Not permitted	Do
Inside buildings not in a special room and exposed to other occupancies.	IV	Not permitted	Do	Do

NOTE: This table does not apply to the storage in dewars of the type generally used in laboratories for experimental purposes.





## Appendix 43-5

### Bulk Oxygen Systems (29 CFR 1910.104(b)(3))

#### A. Flammable Liquid Storage Aboveground

Distance (feet)	Capacity (gallons)
50	0 to 1000
90	1001 or more

#### B. Flammable Liquid Storage Belowground

Distance measured horizontally from oxygen storage container to flammable liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to flammable liquid tank (feet)	Capacity (gallons)
15	50	0 to 1000
30	50	1001 or more

#### C. Combustible Liquid Storage Aboveground

Distance (feet)	Capacity (gallons)
25	0 to 1000
50	1001 or more

#### D. Combustible Liquid Storage Belowground

Distance measured horizontally from oxygen storage container to combustible liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to combustible liquid tank (feet)
15	40

#### E. Flammable Gas Storage

Distance (feet)	Capacity (cu. ft. NTP)
50	Less than 5000
90	5000 or more



## **CHAPTER 44**

### **ACCIDENT PREVENTION SIGNS AND TAGS**

## CHAPTER 44

### SAFETY: ACCIDENT PREVENTION SIGNS AND TAGS

#### ECAMP-ANG

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#### Compliance Definitions

- *BIOHAZARD* - see *Biological Hazard* (29 CFR 1910.145(f)(2)).
- *Biological Hazard* - those infectious agents presenting a risk of death, injury, or illness to personnel (29 CFR 1910.145(f)(2)).
- *Major Message* - that portion of a tag's inscription that is more specific than the signal word and that indicates the specific hazardous condition or the instruction to be communicated to personnel. Examples include: "High Voltage," "Close Clearance," "Do Not Start," or "Do Not Use," or a corresponding pictograph used with a written text or alone (29 CFR 1910.145(f)(2)).
- *Pictograph* - a pictorial representation used to identify a hazardous condition or to convey a safety instruction (29 CFR 1910.145(f)(2)).
- *Sign* - a surface prepared for the warning of, or safety instructions of, industrial workers or members of the public who may be exposed to hazards. Excluded from this definition are news releases, displays commonly known as safety posters, and bulletins used for employee education (29 CFR 1910.145(b)).
- *Signal Word* - that portion of a tag's inscription that contains the word or words that are intended to capture the immediate attention of personnel (29 CFR 1910.145(f)(2)).
- *Tag* - a device usually made of card, paper, pasteboard, plastic, or other material used to identify a hazardous condition (29 CFR 1910.145(f)(2)).



## **SAFETY: GENERAL ENVIRONMENTAL CONTROLS**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Specifications for Accident Prevention Signs and Tags	AP.10.1 through AP.10.21	44-5



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Verify that safety instruction signs are used where there is a need for general instructions and suggestions relative to safety measures.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<b>AP.10.4.</b> All signs must meet certain design criteria (29 CFR 1910.145(d)(1)).	Verify that all signs are furnished with rounded or blunt corners.
	Verify that all signs are free from sharp edges, burrs, splinters, or other sharp projections.
	Verify that the ends or heads of bolts or other fastening devices are located in such a way that they do not constitute a hazard.
<b>AP.10.5.</b> Danger signs must meet specific color requirements (29 CFR 1910.145(d)(2)).	Verify that danger signs use opaque glossy red, black, and white.
<b>AP.10.6.</b> Caution signs must meet specific color requirements (29 CFR 1910.145(d)(4)).	Verify that, for caution signs, standard colors are the following:  - the background is yellow - the panel is black with yellow letters - letters used against the yellow background are black.
<b>AP.10.7.</b> Safety instruction signs must meet specific color requirements (29 CFR 1910.145(d)(6)).	Verify that, for safety instruction signs, standard colors are the following:  - the background is white - the panel is green with white letters - letters used against the white background are black.
<b>AP.10.8.</b> Slow-moving vehicle emblems must meet specific requirements (29 CFR 1910.145(d)(10)).	(NOTE: 29 CFR 1910.145, Figure J-7 illustrates the design of the slow-moving vehicle emblem.)  Verify that the emblem consists of a fluorescent yellow-orange triangle with a dark red reflective border.  Verify that the emblem is used only on vehicles which by design move slowly (25 m.p.h. or less) on the public roads.  (NOTE: The emblem is not a clearance marker for wide machinery nor is it intended to replace required lighting or marking of slow-moving vehicles.)  Verify that neither the color film pattern and its dimensions nor the backing is altered to permit use of advertising or other markings.
<b>AP.10.9.</b> The wording of signs must meet specific requirements (29 CFR 1910.145(e)(2)).	Verify that the wording of any sign is concise and easily read.  Verify that the sign contains sufficient information to be easily understood.  Verify that the wording makes a positive, rather than negative suggestion.  Verify that the wording is accurate in fact.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>AP.10.10.</b> The biological hazard warning must be used to signify and identify the actual or potential presence of a biohazard (29 CFR 1910.145(e)(4)).	Verify that a biological hazard warning is used to signify the actual or potential presence of a biohazard and to identify equipment, containers, rooms, materials, experimental animals, or combinations thereof which contain or are contaminated with, viable hazardous agents.  (NOTE: The term "biological hazard," or "biohazard," as used in this checklist item only, includes only those infectious agents presenting a risk or potential risk to the well-being of man.)
<b>AP.10.11.</b> Tags must be used to prevent accidental injury or illness to personnel who are exposed to actual or potential hazards which are out of the ordinary, unexpected or not readily apparent (29 CFR 1910.145(f)(3)).	Verify that tags are used to prevent accidental injury of illness to personnel who are exposed to hazardous or potentially hazardous conditions, equipment or operations which are out of the ordinary, unexpected or not readily apparent.  Verify that tags are used until such time as the identified hazard is eliminated or the hazardous operation is completed. (NOTE: Tags need not be used where signs, guarding, or other positive means of protection are being used.)
<b>AP.10.12.</b> Required tags must contain a signal word and a major message (29 CFR 1910.145(f)(4)(i)).	Verify that all required tags contain a signal word and a major message.
<b>AP.10.13.</b> The signal word and the major message must meet specific requirements (29 CFR 1910.145(f)(4)(i)).	Verify that the signal word is one of the following:  <ul style="list-style-type: none"> <li>- "Danger"</li> <li>- "Caution"</li> <li>- "Biological Hazard"</li> <li>- "BIOHAZARD"</li> <li>- the biological hazard symbol.</li> </ul> Verify that major message indicates the specific hazardous condition or the instruction to be communicated to the employee.
<b>AP.10.14.</b> Presentation of the signal word and major message must meet certain requirements (29 CFR 1910.145(f)(4)(ii) and 1910.145(f)(4)(iii)).	Verify that the signal word is readable at a minimum distance of five feet (1.52 m) or such greater distance as warranted by the hazard.  Verify that the major message is presented in either pictographs, written text or both.
<b>AP.10.15.</b> The signal word and major message must be understandable (29 CFR 1910.145(f)(4)(iv)).	Verify that the signal word and major message are understandable to all employees who may be exposed to the identified hazard.

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>AP.10.16.</b> Personnel must be informed as to the meaning of tags and to the necessary special pre-cautions (29 CFR 1910.145(f)(4)(v)).	Verify that all personnel are informed as to the meaning of the various tags used throughout the workplace and what special precautions are necessary.
<b>AP.10.17.</b> Tags must be affixed in accordance with certain requirements (29 CFR 1910.145(f)(4)(vi)).	Verify that tags are affixed as close as safely possible to their respective hazards by a positive means such as string, wire, or adhesive that prevents their loss or unintentional removal.
<b>AP.10.18.</b> Danger tags must be used in major hazard situations where an immediate hazard presents a threat of death or serious injury (29 CFR 1910.145(f)(5)).	Verify that danger tags are used in major hazard situations where an immediate hazard presents a threat of death or serious injury to personnel.  Verify that danger tags are used only in these situations.
<b>AP.10.19.</b> Caution tags must be used in minor hazard situations where a non-immediate or potential hazard or unsafe practice presents a lesser threat of employee injury (29 CFR 1910.145(f)(6) and (f)(7)).	Verify that caution tags are used in minor hazard situations where a non-immediate or potential hazard or unsafe practice presents a lesser threat of employee injury.  Verify that caution tags are used only in these situations.  (NOTE: Warning tags may be used to represent a hazard level between "Caution" and "Danger," instead of the required "Caution" tag, provided that they have a signal word of "Warning," an appropriate major message, and otherwise meet the general tag criteria of 29 CFR 1910.145(f)(4) (see checklist items AP.10.12 through AP.10.17.)
<b>AP.10.20.</b> Biological hazard tags must be used and be configured according to certain requirements (29 CFR 1910.145(f)(8)).	Verify that biological hazard tags are used to identify the actual or potential presence of a biological hazard and to identify equipment, containers, rooms, experimental animals, or combinations thereof, that contain or are contaminated with, viable hazardous agents.  Verify that the symbol design for biological hazard tags conform to the design illustrated in 29 CFR 1910.145(f)(8)(ii).
<b>AP.10.21.</b> Other tags must not detract from the impact or visibility of required tags (29 CFR 1910.145(f)(9)).	Verify that tags used in addition to those required by 29 CFR 1910.145(f) (see checklist items AP.10.11 through AP.10.21), or in other situations where tags are not required, do not detract from the impact or visibility of the signal word and major message of any required tag.

## **CHAPTER 45**

### **PERMIT-REQUIRED CONFINED SPACES**

## CHAPTER 45

### SAFETY: PERMIT-REQUIRED CONFINED SPACES

#### ECAMP-ANG

September 1997

#### Compliance Definitions

- *Acceptable Entry Conditions* - the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space (29 CFR 1910.146(b)).
- *Attendant* - an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program (29 CFR 1910.146(b)).
- *Authorized Entrant* - regarding permit-required confined spaces, an authorized entrant is an employee who is authorized by the employer to enter a permit space (29 CFR 1910.146(b)).
- *Blanking or Blinding* - the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure for the pipe, line, or duct with no leakage beyond the plate (29 CFR 1910.146(b)).
- *Confined Space* - regarding permit-required confined spaces, a confined space means a space that (29 CFR 1910.146(b)):
  1. is large enough and so configured that an employee can bodily enter and perform assigned work
  2. has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry), and
  3. is not designed for continuous employee occupancy.
- *Double Block and Bleed* - the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves (29 CFR 1910.146(b)).
- *Emergency* - any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants (29 CFR 1910.146(b)).
- *Engulfment* - the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing (29 CFR 1910.146(b)).
- *Entry* - the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space (29 CFR 1910.146(b)).
- *Entry Permit* - the written or printed document that the installation provides to allow and control entry into a permit space and that contains the information specified in 29 CFR 1910.146(f) (29 CFR 1910.146(b)).
- *Entry Supervisor* - the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this chapter (29 CFR 1910.146(b)).

(NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this chapter for each role he or she fills.)

(NOTE: The duties of entry supervisor may be passed from one individual to another during the course of an entry operation.)

- *Hazardous Atmosphere* - an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (i.e., escape unaided from a permit space), injury, or acute illness from one or more of the following causes (29 CFR 1910.146(b)):

1. flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL)
2. airborne combustible dust at a concentration that meets or exceeds its LFL

(NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 ft (1.52 m) or less.)

3. atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
4. atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental control, or in Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit

(NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.)

5. any other atmospheric condition that is immediately dangerous to life or health.

(NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard (29 CFR 1910.1200), published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.)

- *Hot Work Permit* - the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition (29 CFR 1910.146(b)).
- *Immediately Dangerous to Life or Health (IDLH)* - any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space (29 CFR 1910.146(b)).

(NOTE: Some materials-hydrogen fluoride gas and cadmium vapor, for example-may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.)

- *Inerting* - the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible (29 CFR 1910.146(b)).

(NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.)

- *Isolation* - the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages (29 CFR 1910.146(b)).

- *Line Breaking* - the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury (29 CFR 1910.146(b)).
- *Non-Permit Confined Space* - a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm (29 CFR 1910.146(b)).
- *Oxygen Deficient Atmosphere* - an atmosphere containing less than 19.5 percent oxygen by volume (29 CFR 1910.146(b)).
- *Oxygen Enriched Atmosphere* - an atmosphere containing more than 23.5 percent oxygen by volume (29 CFR 1910.146(b)).
- *Permit-Required Confined Space (Permit Space)* - a confined space that has one or more of the following characteristics (29 CFR 1910.146(b)):
  1. contains or has a potential to contain a hazardous atmosphere;
  2. contains a material that has the potential for engulfing an entrant;
  3. has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
  4. contains any other recognized serious safety or health hazard.
- *Permit-Required Confined Space Program (Permit Space Program)* - The employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces (29 CFR 1910.146(b)).
- *Permit System* - the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry (29 CFR 1910.146(b)).
- *Prohibited Condition* - any condition in a permit space that is not allowed by the permit during the period when entry is authorized (29 CFR 1910.146(b)).
- *Rescue Service* - the personnel designated to rescue employees from permit spaces (29 CFR 1910.146(b)).
- *Retrieval System* - the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces (29 CFR 1910.146(b)).
- *Testing* - the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space (29 CFR 1910.146(b)).

(NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.)



## **SAFETY: PERMIT-REQUIRED CONFINED SPACES**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements	PS.10.1 through PS.10.36	45-7
Alternate Entry Procedures	PS.20.1 through PS.20.5	45-19



**COMPLIANCE CATEGORY:**  
**SAFETY: PERMIT-REQUIRED CONFINED SPACES**  
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<p><b>PERMIT-REQUIRED CONFINED SPACES</b></p> <p><b>PS.10</b> <b>General Requirements</b></p> <p><b>PS.10.1.</b> Installations must evaluate the work-place to determine whether any spaces are permit-required confined spaces (29 CFR 1910.146(c)(1)).</p> <p><b>PS.10.2.</b> Installations with permit spaces must inform exposed personnel of the existence and location of and the danger posed by such spaces (29 CFR 1910.146(c)(2)).</p> <p><b>PS.10.3.</b> Installations whose personnel may enter permit spaces must develop, implement, and make available a written permit space program (29 CFR 1910.146(c)(4)).</p> <p><b>PS.10.4.</b> Installations must re-evaluate any nonpermit-required spaces whenever there are changes in their use or configuration (29 CFR 1910.146(c)(6)).</p>	<p>Verify that the installation has evaluated its workplaces to determine whether any spaces are permit-required confined spaces.</p> <p>(NOTE: Proper application of the decision flowchart in Appendix A to 29 CFR 1910.146 may facilitate compliance with this requirement.)</p> <p>Verify that the installation posts danger signs or uses any other equally effective means to inform exposed personnel of the existence and location of and danger posed by permit spaces.</p> <p>(NOTE: A sign reading DANGER--PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER or using other similar language would satisfy this requirement.)</p> <p>Verify that the installation takes effective steps to prevent personnel from entering permit spaces.</p> <p>Verify that the installation develops and implements a written permit space program.</p> <p>Verify that the written program is made available for inspection by personnel and their authorized representatives.</p> <p>Verify that this program meets the requirements of 29 CFR 1910.146(d) (see checklist items PS.10.8 through PS.10.17).</p> <p>(NOTE: Appendix C to 29 CFR 1910.146 provides examples of permit space programs that meet the requirements of 29 CFR 1910.146(d).)</p> <p>Verify that the installation evaluates any nonpermit-required space whenever there are changes in the use or configuration of the space.</p> <p>Verify that, if necessary, the installation reclassifies such a space as a permit-required space.</p>

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<p><b>PS.10.5.</b> Installations must follow specific procedures to reclassify a permit-required space as nonpermit-required (29 CFR 1910.146(c)(7)).</p>	<p>Verify that, if the installation reclassifies a permit-required space as nonpermit-required, the permit space poses no actual or potential atmospheric hazards and that all hazards within the space are eliminated without entry into the space.</p> <p>Verify that, if it is necessary to enter the permit space to eliminate hazards, such entry is performed according to the requirements of 29 CFR 1910.146(d) through (k) (see checklist items PS.10.8 through PS.10.36).</p> <p>(NOTE: If testing and inspection during entry demonstrates that the hazards within the permit space have been eliminated, the permit space may be reclassified as a nonpermit-required space for as long as the hazards remain eliminated.)</p> <p>(NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. 29 CFR 1910.146(c)(5) (see the checklist items in PS.20) covers permit space entry where the installation can demonstrate that forced air ventilation alone will control all hazards in the space.)</p> <p>Verify that the installation documents the basis for determining that all hazards in the permit space have been eliminated through a written certification that includes:</p> <ul style="list-style-type: none"> <li>- the date</li> <li>- the location of the space</li> <li>- the signature of the person making the determination.</li> </ul> <p>Verify that such certification is made available to each individual entering the space.</p> <p>Verify that, if hazards arise within a permit space that has been declassified to a nonpermit-required space:</p> <ul style="list-style-type: none"> <li>- each individual exits the space</li> <li>- the installation re-evaluates the space and determines whether it should be classified as a permit-required space.</li> </ul>
<p><b>PS.10.6.</b> Installations must meet specific requirements with regard to contractors whose work requires them to enter permit spaces (29 CFR 1910.146(c)(8) and AFI 91-301, para 9).</p>	<p>Determine whether the installation uses contractors to perform work that involves permit space entry.</p> <p>Verify that the installation does the following:</p> <ul style="list-style-type: none"> <li>- informs the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program that meets the requirements of 29 CFR 1910.146</li> <li>- apprises the contractor of the elements, including the hazards identified and the installation's experience with the space, that make the space a permit space</li> <li>- apprises the contractor of any precautions or procedures that the installation</li> </ul>

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<p><b>PS.10.7.</b> Installations must implement measures necessary to prevent unauthorized entry to permit spaces (29 CFR 1910.146(d)(1)).</p> <p><b>PS.10.8.</b> Installations must identify and evaluate the hazards of permit spaces before personnel enter them (29 CFR 1910.146(d)(2)).</p> <p><b>PS.10.9.</b> Installations must develop and implement the means, procedures, and practices necessary for safe permit space entry operations (29 CFR 1910.146(d)(3)).</p> <p><b>PS.10.10.</b> Installations must provide at no cost, maintain, and ensure the use of certain equipment by personnel who enter permit spaces (29 CFR 1910.146(d)(4)).</p>	<p>has implemented for the protection of personnel in or near permit spaces where contractor personnel will be working</p> <ul style="list-style-type: none"> <li>- coordinates entry operations with the contractor, when both installation personnel and contractor personnel will be working in or near permit spaces</li> <li>- debriefs the contractor at the conclusion of the entry operations regarding: <ul style="list-style-type: none"> <li>- the permit space program</li> <li>- any hazards confronted or created in permit spaces during entry operations.</li> </ul> </li> </ul> <p>(NOTE: Contractors are solely responsible for compliance with OSHA standards. Air Force safety, fire protection, and BE officials do not have the authority to direct contractor activities unless a condition exists which presents imminent danger to Air Force personnel.)</p> <p>(NOTE: 29 CFR 1910.146(c)(9) outlines the responsibilities of contractors with regard to permit space entry.)</p> <p>Verify that the installation implements all necessary measures to prevent unauthorized entry to permit spaces.</p> <p>Verify that, before personnel enter a permit space, the installation has identified it as such and evaluated its hazards.</p> <p>Verify that the installation has developed and implemented procedures for safe permit space entry operations including, but not limited to:</p> <ul style="list-style-type: none"> <li>- specifying acceptable entry conditions</li> <li>- isolating the permit space</li> <li>- purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards</li> <li>- providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards</li> <li>- verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.</li> </ul> <p>Verify that the installation provides the following equipment at no cost to personnel:</p> <ul style="list-style-type: none"> <li>- testing and monitoring equipment needed to meet the requirements of 29 CFR 1910.146(d)(5) (see checklist item PS.10.12)</li> <li>- ventilating equipment needed to obtain acceptable entry conditions</li> <li>- communications equipment needed to meet the requirements of 29 CFR</li> </ul>

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<p><b>PS.10.11.</b> Installations must evaluate permit space conditions before and during entry operations (29 CFR 1910.146(d)(5)).</p>	<p>1910.146(h)(3) and (i)(5) (see checklist items PS.10.27 and PS.10.29)</p> <ul style="list-style-type: none"> <li>- PPE to the extent that feasible engineering and work practice controls do not adequately protect personnel</li> <li>- lighting equipment to enable personnel to see well enough to work safely and to exit quickly in an emergency</li> <li>- barriers and shields as required by 29 CFR 1910.146(d)(3)(iv) (see checklist item PS.10.10)</li> <li>- equipment, such as ladders, needed for safe entrance and exit by authorized entrants</li> <li>- rescue and emergency equipment needed to meet the requirements of 29 CFR 1910.146(d)(9) (see checklist item PS.10.16) to the extent that it is not provided by rescue services</li> <li>- other equipment needed for safe entry into and rescue from permit spaces.</li> </ul> <p>Verify that the installation maintains and ensures the use of such equipment.</p> <p>Verify that the installation tests conditions in the permit space to determine if acceptable entry conditions exist before authorization is given to begin entry.</p> <p>Verify that, if isolation of the space is infeasible because the space is large or part of a continuous system (such as a sewer), the installation:</p> <ul style="list-style-type: none"> <li>- performs testing to the extent feasible before entry is authorized</li> <li>- monitors continuously in areas where authorized entrants are working, after entry has been authorized.</li> </ul> <p>Verify that the installation tests or monitors permit space as necessary to determine whether acceptable conditions are being maintained during the course of entry operations.</p> <p>Verify that, when testing for atmospheric hazards, the installation tests for conditions in the following order:</p> <ul style="list-style-type: none"> <li>- O<sub>2</sub></li> <li>- combustible gases and vapors</li> <li>- toxic gases and vapors.</li> </ul> <p>(NOTE: Atmospheric testing conducted in accordance with Appendix B to 29 CFR 1910.146 would satisfy the testing requirements. For permit space operations in sewers, atmospheric testing conducted in accordance with Appendices B and E to 29 CFR 1910.146 would satisfy the requirements.)</p>
<p><b>PS.10.12.</b> Installations must provide at least one attendant outside the permit space into which entry is authorized (29</p>	<p>Verify that the installation provides at least one attendant outside a permit space for the duration of entry operations.</p> <p>(NOTE: Attendants may be assigned to monitor more than one permit space provided that the duties described in 29 CFR 1910.146(i) (see checklist item</p>

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<p>CFR 1910.146(d)(6)).</p> <p><b>PS.10.13.</b> Attendants who monitor multiple permit spaces must have the means and procedures to respond to emergencies (29 CFR 1910.146(d)(7)).</p> <p><b>PS.10.14.</b> Installations must designate personnel who are to have active roles in entry operations (29 CFR 1910.146(d)(8)).</p> <p><b>PS.10.15.</b> Installations must develop and implement permit space entry procedures (29 CFR 1910.146(d)(9) through (d)(12)).</p> <p><b>PS.10.16.</b> Installations must review and revise entry operations when necessary (29 CFR 1910.146(d)(13) and (d)(14)).</p>	<p>PS.10.29) can be effectively performed for each monitored permit space. Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the above referenced duties can be effectively performed for each monitored permit space.)</p> <p>Verify that the installation includes in its permit program the means and procedures necessary for an attendant to respond to an emergency affecting one or more monitored spaces without distraction from his/her responsibilities.</p> <p>Verify that the installation designates the personnel who take active roles in entry operations and identifies their duties.</p> <p>Verify that the installation provides such personnel with necessary training, as required by 29 CFR 1910.146(g) (see checklist items PS.10.23 through PS.10.25).</p> <p>Verify that the installation develops and implements emergency procedures, including procedures for:</p> <ul style="list-style-type: none"> <li>- summoning rescue and emergency services</li> <li>- rescuing entrants from permit spaces</li> <li>- providing necessary emergency services to rescued personnel</li> <li>- preventing unauthorized personnel from attempting rescue.</li> </ul> <p>Verify that the installation develops and implements a system for the preparation, issuance, use, and cancellation of entry permits.</p> <p>Verify that the installation develops and implements procedures to coordinate entry operations when multiple personnel are working simultaneously as authorized entrants in a permit space.</p> <p>Verify that the installation develops and implements procedures (such as closing off a permit space and canceling the permit) necessary to complete entry operations.</p> <p>Verify that the installation reviews entry operations whenever it suspects personnel are not adequately protected by measures taken under the permit entry program.</p> <p>Verify that, if the review reveals that deficiencies exist, the installation revises the program to correct such deficiencies before subsequent entries take place.</p> <p>(NOTE: The following are examples of circumstances that require an installation to review the permit entry program:</p>

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<p><b>PS.10.17.</b> Installations must prepare an entry permit before entry is authorized (29 CFR 1910.146(e)(1), (e)(2), and (e)(4))</p> <p><b>PS.10.18.</b> Completed entry permits must be made available to all authorized entrants at the time of entry (29 CFR 1910.146(e)(3)).</p> <p><b>PS.10.19.</b> Entry permit supervisors must terminate entry and cancel the entry permit under specific circumstances (29 CFR 1910.146(e)(5)).</p> <p><b>PS.10.21.</b> Installations must retain canceled entry permits for at least 1 yr (29 CFR 1910.146(e)(6)).</p> <p><b>PS.10.22.</b> Entry permits must contain specific information (29 CFR 1910.146(e)(6) and (f)).</p>	<ul style="list-style-type: none"> <li>- any unauthorized entry of a permit space</li> <li>- the detection of a permit space hazard not covered by the permit</li> <li>- the detection of a condition prohibited by the permit</li> <li>- the occurrence of an injury or near-miss during entry</li> <li>- a change in the use or configuration of a permit space</li> <li>- personnel complaints about the effectiveness of the program.)</li> </ul> <p>Verify that the installation reviews and, if necessary, revises its permit space program within 1 yr of each entry.</p> <p>(NOTE: The installation may conduct a single annual review covering all entries performed during a 12-mo period. If no entry is performed during a 12-mo period, no review is necessary.)</p> <p>Verify that the installation prepares an entry permit before an entry is authorized.</p> <p>Verify that, prior to authorizing entry, the entry supervisor identified on the permit signs the permit.</p> <p>Verify that the duration of the permit does not exceed the time required to complete the assigned task or job identified on the permit.</p> <p>Verify that the installation posts the entry permit at the entry portal or uses any other equally effective means to allow authorized entrants to confirm that pre-entry preparations have been completed.</p> <p>Verify that the entry supervisor terminates entry and cancels the permit when:</p> <ul style="list-style-type: none"> <li>- the entry operations covered by the permit have been completed, or</li> <li>- a condition that is not allowed under the entry permit arises in or near the permit space.</li> </ul> <p>Verify that the installation retains each canceled entry permit for at least 1 yr.</p> <p>Verify that entry permits identify:</p> <ul style="list-style-type: none"> <li>- the permit space to be entered</li> <li>- the purpose of the entry</li> <li>- the date and authorized duration of the entry permit</li> <li>- authorized entrants within the permit space, by name or by other means</li> </ul>

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<p><b>PS.10.23.</b> Installations must provide training to all affected personnel (29 CFR</p>	<p>(e.g., through the use of rosters or tracking systems) that will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space</p> <ul style="list-style-type: none"> <li>- the names of personnel who are currently serving as attendants</li> <li>- the name of the individual who is currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry</li> <li>- the hazards of the permit space to be entered</li> <li>- measures used to isolate the permit space and eliminate or control permit space hazards before entry</li> <li>- acceptable entry conditions</li> <li>- the results of initial and periodic tests performed under 29 CFR 1910.146(d)(5) (see checklist item PS.10.12), accompanied by: <ul style="list-style-type: none"> <li>- the names or initials of the testers</li> <li>- an indication of when the tests were performed</li> </ul> </li> <li>- the rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services</li> <li>- communication procedures used by authorized entrants and attendants to maintain contact during the entry</li> <li>- equipment, such as PPE, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with 29 CFR 1910.146</li> <li>- any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure personnel safety</li> <li>- any additional permits, such as for hot work, that have been issued to authorize work in the permit space.</li> </ul> <p>(NOTE: Appendix D to 29 CFR 1910.146 provides examples of completed entry permits that meet the requirements of this checklist item.)</p> <p>(NOTE: Installations may meet the requirement to identify authorized entrants on the permit by inserting a reference as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.)</p> <p>(NOTE: Installations may use such measures as the locking out or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces to isolate the permit space and eliminate or control hazards.)</p> <p>Verify that canceled permits note any problems encountered during the entry operation.</p> <p>Verify that the installation provides training to each affected individual:</p> <ul style="list-style-type: none"> <li>- before he/she is first assigned duties regulated by 29 CFR 1910.146</li> <li>- before there is a change in assigned duties</li> </ul>

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<p>1910.146(g)(1) and (g)(2)).</p> <p><b>PS.10.24.</b> Training must establish personnel proficiency in required duties and provide instruction about new or revised procedures (29 CFR 1910.146(g)(3)).</p> <p><b>PS.10.25.</b> Installations must certify that affected personnel have received training (29 CFR 1910.146(g)(4)).</p> <p><b>PS.10.26.</b> Authorized entrants must know entry hazards and use their equipment properly (29 CFR 1910.146(h)(1) and (h)(2)).</p> <p><b>PS.10.27.</b> Authorized entrants must communicate with the attendant as necessary (29 CFR 1910.146(h)(3) and (h)(4)).</p>	<ul style="list-style-type: none"> <li>- whenever there is a change in permit space operations that presents a hazard about which the individual has not received training</li> <li>- whenever the installation has reason to believe that either: <ul style="list-style-type: none"> <li>- there have been deviations from the permit space entry procedures, or</li> <li>- there are inadequacies in the individual's knowledge or use of permit space entry procedures.</li> </ul> </li> </ul> <p>Verify that training establishes the proficiency of affected personnel in their required duties and instructs them in any new or revised procedures.</p> <p>Verify that the installation provides certification that training has been accomplished.</p> <p>Verify that such certification includes:</p> <ul style="list-style-type: none"> <li>- each individual's name</li> <li>- the signatures or initials of the trainers</li> <li>- dates of training.</li> </ul> <p>Verify that the installation makes training certification available to affected personnel or their authorized representatives for inspection.</p> <p>Verify that all authorized entrants know the hazards they may face during entry, including:</p> <ul style="list-style-type: none"> <li>- information on the mode, signs, or symptoms of exposure</li> <li>- consequences of exposure.</li> </ul> <p>Verify that authorized attendants use their equipment in accordance with 29 CFR 1910.146(d)(4) (see checklist item PS.10.11).</p> <p>Verify that authorized entrants communicate with the attendant as necessary:</p> <ul style="list-style-type: none"> <li>- to enable the attendant to monitor entrant status</li> <li>- to enable the attendant to alert entrants of the need to evacuate the space as required by 29 CFR 1910.146(i)(6) (see checklist item PS.10.29).</li> </ul> <p>Verify that authorized entrants alert the attendant whenever:</p> <ul style="list-style-type: none"> <li>- they recognize any warning sign or symptom of exposure to a dangerous situation, or</li> <li>- they detect a prohibited condition.</li> </ul>

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<b>PS.10.28.</b> Authorized entrants must exit permit spaces under specific circumstances (29 CFR 1910.146(h)(5)).	Verify that authorized entrants exit a permit space as quickly as possible whenever: <ul style="list-style-type: none"> <li>- an order to evacuate is given by the attendant or entry supervisor</li> <li>- the entrant recognizes any warning sign or symptom of exposure to a dangerous situation</li> <li>- the entrant detects a prohibited condition</li> <li>- an evacuation alarm is sounded.</li> </ul>
<b>PS.10.29.</b> Installations must ensure that each attendant meets certain requirements (29 CFR 1910.146(i)).	Verify that the installation ensures that each attendant: <ul style="list-style-type: none"> <li>- knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure</li> <li>- is aware of possible behavioral effects of hazard exposure in authorized entrants</li> <li>- continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants accurately identifies who is in the permit space</li> <li>- remains outside the permit space during entry operations until relieved by another attendant</li> <li>- communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space</li> <li>- monitors activities inside and outside the space to determine whether it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:                             <ul style="list-style-type: none"> <li>- if the attendant detects a prohibited condition</li> <li>- if the attendant detects the behavioral effects of hazard exposure in an authorized entrant</li> <li>- if the attendant detects a situation outside the space that could endanger the authorized entrants</li> <li>- if the attendant cannot effectively and safely perform all the duties required of an attendant</li> </ul> </li> <li>- summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards</li> <li>- takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:                             <ul style="list-style-type: none"> <li>- warn the unauthorized persons that they must stay away from the permit space</li> <li>- advise the unauthorized persons that they must exit immediately if they have entered the permit space</li> <li>- inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space</li> </ul> </li> <li>- performs nonentry rescues as specified by the employer's rescue procedure</li> </ul>

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<p><b>PS.10.30.</b> Installations must ensure that each entry supervisor meets certain requirements (29 CFR 1910.146(j)).</p> <p><b>PS.10.31.</b> Installations must ensure that each member of the rescue service is provided with, and is trained to use properly, the PPE and rescue equipment necessary for making rescues from permit spaces (29 CFR 1910.146(k)(1)(i)).</p> <p><b>PS.10.32.</b> Installations must ensure that each member of the rescue service meets specific requirements with regard to training (29 CFR 1910.146(k)(1)(ii) through (k)(1)(iv)).</p>	<ul style="list-style-type: none"> <li>- performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.</li> </ul> <p>(NOTE: When the installation's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by 29 CFR 1910.146(k)(1) (see checklist items PS.10.31 and PS.10.32), and if they have been relieved as required by this checklist item.)</p> <p>Verify that the installation ensures that each entry supervisor:</p> <ul style="list-style-type: none"> <li>- knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure</li> <li>- verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin</li> <li>- terminates the entry and cancels the permit as required by 29 CFR 1910.146(e)(5) (see checklist item PS.10.20)</li> <li>- verifies that rescue services are available and that the means for summoning them are operable</li> <li>- removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations</li> <li>- determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.</li> </ul> <p>(NOTE: The rescue and emergency supervisor requirements of 29 CFR 1910.146(k) (see checklist items PS.10.31 through PS.10.36) apply to installations that have personnel enter permit spaces to perform rescue services.)</p> <p>Verify that each member of the rescue service is provided with, and is trained to use properly, the PPE and rescue equipment necessary for making rescues from permit spaces.</p> <p>Verify that each member of the rescue service is trained to perform the assigned rescue duties.</p> <p>Verify that each member of the rescue service also receives the training required of authorized entrants under 29 CFR 1910.146(g) (see checklist items PS.10.23 through PS.10.25).</p>

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<p><b>PS.10.33.</b> Specific requirements must be met by installations that have persons other than their own personnel perform permit space rescue (29 CFR 1910.146(k)(2)).</p> <p><b>PS.10.34.</b> Installations must use retrieval systems or methods to facilitate nonentry rescue (29 CFR 1910.146(k)(3)).</p> <p><b>PS.10.35.</b> Retrieval systems must meet specific requirements (29 CFR 1910.146(k)(3)(i) and (k)(3)(ii)).</p>	<p>Verify that each member of the rescue service is trained in basic first-aid and in cardiopulmonary resuscitation (CPR).</p> <p>Verify that at least one member of the rescue service holding current certification in first aid and in CPR is available.</p> <p>Verify that each member of the rescue service practices making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.</p> <p>Verify that representative permit spaces simulate the types of permit spaces from which rescue is to be performed, with respect to opening size, configuration, and accessibility.</p> <p>Determine whether the installation has persons other than its own personnel perform permit space rescue.</p> <p>Verify that the installation informs the rescue service of the hazards they may confront when called on to perform rescue at the installation.</p> <p>Verify that the installation provides the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.</p> <p>Verify that the installation uses retrieval systems or methods to facilitate nonentry rescue whenever an authorized entrant enters a permit space.</p> <p>(NOTE: This requirement does not apply if the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.)</p> <p>Verify that each authorized entrant uses a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head.</p> <p>(NOTE: Wristlets may be used in lieu of the chest or full body harness if it can be demonstrated that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.)</p> <p>Verify that the other end of the retrieval line is attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.</p>

<b>COMPLIANCE CATEGORY:</b> <b>SAFETY: PERMIT-REQUIRED CONFINED SPACES</b> <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b>	
<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> <b>September 1997</b>
<b>PS.10.36.</b> MSDSs or written information must be made available to medical facilities treating exposed entrants (29 CFR 1910.146(k)(4)).	<p>Verify that a mechanical device is available to retrieve personnel from vertical type permit spaces more than 5 ft [1.52 m] deep.</p> <p>Verify that, if an injured entrant is exposed to a substance for which an MSDS or other similar written information is required to be kept at the worksite, the MSDS or written information is made available to the medical facility treating the exposed entrant.</p>

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REGULATORY REQUIREMENTS:	REVIEWER CHECKS: September 1997
<p><b>PERMIT-REQUIRED CONFINED SPACES</b></p> <p><b>PS.20</b> <b>Alternate Entry Procedures</b></p>	<p>(NOTE: Installations may follow the alternate procedures for entering a permit space described in 29 CFR 1910.146(c)(5) (see the checklist items in PS.20) only if:</p> <ul style="list-style-type: none"> <li>- they can demonstrate that:               <ul style="list-style-type: none"> <li>- the only hazard posed by the permit space is an actual or potential hazardous atmosphere</li> <li>- continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry</li> </ul> </li> <li>- they develop monitoring and inspection data that supports the above demonstrations</li> <li>- any initial entry into a permit space necessary for obtaining the above data is done in accordance with 29 CFR 1910.146(d) through (k) (see checklist items PS.10.8 through PS.10.36)</li> <li>- the determination and supporting data required above are documented and made available to each individual who enters the permit space.)</li> </ul> <p>(NOTE: Installations that cannot meet the above requirements or choose not to use the alternate entry procedures must meet all of the requirements of 29 CFR 1910.146(d) through (f) and (h) through (k) (see checklist items PS.10.8 through PS.10.22 and PS.10.26 through PS.10.36).)</p>
<p><b>PS.20.1.</b> Entrance covers must be removed according to specific procedures (29 CFR 1910.146(c)(5)(ii)(A) and (c)(5)(ii)(B)).</p>	<p>Verify that the installation eliminates any conditions making it unsafe to remove an entrance cover before removing it.</p> <p>Verify that, when entrance covers are removed, the opening is promptly guarded by a railing, temporary cover, or other temporary barrier that will:</p> <ul style="list-style-type: none"> <li>- prevent an accidental fall through the opening</li> <li>- protect personnel working in the space from foreign objects entering the space.</li> </ul>
<p><b>PS.20.2.</b> The internal atmosphere must be tested before an individual enters a permit space and ensure that the atmosphere is not hazardous whenever an individual is inside the space (29 CFR 1910.146(c)(5)(ii)(C) and (c)(5)(ii)(D)).</p>	<p>Verify that, before an individual enters a space, a calibrated instrument is used to test the internal atmosphere for the following conditions (in the order given):</p> <ul style="list-style-type: none"> <li>- O<sub>2</sub> content</li> <li>- flammable gases and vapors</li> <li>- potential toxic air contaminants.</li> </ul> <p>Verify that the installation ensures that the internal atmosphere of a permit space is not hazardous while any individual is inside the space.</p>
<p><b>PS.20.3.</b> Continuous forced air ventilation must be used according to specific procedures (29 CFR</p>	<p>Verify that personnel do not enter permit areas until the forced air ventilation has eliminated any hazardous atmosphere.</p> <p>Verify that the forced air ventilation is directed so as to ventilate the immediate</p>

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<p>1910.146(c)(5)(ii)(E) and 1910.146(c)(5)(ii)(F).</p> <p><b>PS.20.4.</b> Specific steps must be taken if a hazardous atmosphere is detected during entry to a permit space (29 CFR 1910.146(c)(5)(ii)(G)).</p> <p><b>PS.20.5.</b> Installations must certify that a permit space is safe for entry (29 CFR 1910.146(c)(5)(ii)(H)).</p>	<p>areas where an individual is or will be present within the space and continues until all personnel have left the space.</p> <p>Verify that the air supply for forced air ventilation is from a clean source and does not increase the hazards in the space.</p> <p>Verify that the installation periodically tests the atmosphere within the space to ensure that the continuous forced air is preventing the accumulation of a hazardous atmosphere.</p> <p>Verify that, if a hazardous atmosphere is detected during entry, the following steps are taken:</p> <ul style="list-style-type: none"> <li>- each individual inside the space leaves immediately</li> <li>- the space is evaluated to determine how the hazardous atmosphere developed</li> <li>- the installation implements measures to protect personnel from the hazardous atmosphere before any subsequent entry takes place.</li> </ul> <p>Verify that the installation has submitted written certification that:</p> <ul style="list-style-type: none"> <li>- a permit space is safe for entry</li> <li>- the installation has met all pre-entry measures required by 29 CFR 1910.146(c)(5)(ii) (see the checklist items in PS.20).</li> </ul> <p>Verify that such written certification includes:</p> <ul style="list-style-type: none"> <li>- the date</li> <li>- the location of the space</li> <li>- the signature of the person providing the certification.</li> </ul> <p>Verify that certification is made available to each individual entering the space prior to his/her entry.</p>

## **CHAPTER 46**

### **LOCKOUT/TAGOUT**

## CHAPTER 46

### SAFETY: LOCKOUT/TAGOUT

#### ECAMP-ANG

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#### Compliance Definitions

- *Affected Personnel* - personnel whose job requires them to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed. *Affected personnel* become *authorized personnel* when their duties include the performance of servicing or maintenance covered under 29 CFR 1910.147 (29 CFR 1910.147(b)).
- *Authorized Person* - one who locks out or tags out machines or equipment in order to perform servicing or maintenance on those machines or equipment. *Affected personnel* become *authorized personnel* when their duties include the performance of servicing or maintenance covered under 29 CFR 1910.147 (29 CFR 1910.147(b)).
- *Capable of Being Locked Out* - an energy isolating device is *capable of being locked out* if it has a hasp or other means of attachment to or through which a lock can be affixed or if it has a built-in locking mechanism. Other energy isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability (29 CFR 1910.147(b)).
- *Energized* - connected to an energy source or containing residual or stored energy (29 CFR 1910.147(b)).
- *Energy Isolating Device* - a mechanical device that physically prevents the transmission or release of energy including, but not limited to, the following (29 CFR 1910.147(b)):
  1. a manually operated electrical circuit breaker
  2. a disconnect switch
  3. a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and from which no pole can be operated independently
  4. a line valve
  5. a block, or
  6. any similar device used to block or isolate energy.

(NOTE: Push-button, selector switches, and other control circuit type devices are not energy isolating devices.)

- *Energy Source* - any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy (29 CFR 1910.147(b)).
- *Hot Tap* - a procedure used in repair, maintenance, and service activities, that involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems (29 CFR 1910.147(b)).
- *Lockout* - the placement of a lockout device on an energy isolating device, in accordance with an established procedure, to ensure that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed (29 CFR 1910.147(b)).

- *Lockout Device* - a device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds (29 CFR 1910.147(b)).
- *Normal Production Operations* - the utilization of a machine or equipment to perform its intended production function (29 CFR 1910.147(b)).
- *Servicing and/or Maintenance* - regarding the control of hazardous energy, workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning, or unjamming of machines or equipment and making adjustments or tool changes, where personnel may be exposed to the unexpected energizing or start-up of the equipment or release of hazardous energy (29 CFR 1910.147(b)).
- *Setting Up* - any work performed to prepare a machine or equipment to perform its normal production operation (29 CFR 1910.147(b)).
- *Tagout* - the placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed (29 CFR 1910.147(b)).
- *Tagout Device* - a prominent warning device, such as a tag and a means of attachment, which can be fastened securely to an energy isolating device in accordance with an established procedure to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed (29 CFR 1910.147(b)).

**SAFETY: LOCKOUT/TAGOUT**  
**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Lockout/Tagout	LT.10.1 through LT.10.36	46-5



<p align="center"><b>COMPLIANCE CATEGORY:</b>  <b>SAFETY: LOCKOUT/TAGOUT</b>  <b>U.S. TEAM Guide: ECAMP-ANG Supplement, Vol. 2</b></p>	
<p align="center"><b>REGULATORY REQUIREMENTS:</b></p>	<p align="center"><b>REVIEWER CHECKS:</b>  <b>September 1997</b></p>
<p><b>LT.10</b>  <b>LOCKOUT/TAGOUT</b></p>	<p>(NOTE: 29 CFR 1910.147 (see the checklist items in LT.10) applies to activities involving the servicing and maintenance of machines and equipment during which the release of stored energy or the unexpected energizing or startup of such machines or equipment could cause injury to personnel.)</p> <p>(NOTE: 29 CFR 1910.147 does not cover the following:</p> <ul style="list-style-type: none"> <li>- exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations (see 29 CFR 1910, subpart S (Chapter 52: Safety-Related Work Practices))</li> <li>- oil and gas well drilling and servicing</li> <li>- work on cord- and plug-connected electric equipment for which exposure to the hazards of unexpected energizing or startup of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the service or maintenance</li> <li>- hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, provided that the installation demonstrates that: <ul style="list-style-type: none"> <li>- continuity of service is essential</li> <li>- shutdown of the system is impractical</li> <li>- it follows documented procedures and uses special equipment that provides proven effective protection for personnel.)</li> </ul> </li> </ul>
<p><b>LT.10.1.</b> Installations must establish an energy control program that meets specific standards (29 CFR 1910.147(c)(1)).</p>	<p>Verify that the installation has an energy control program that consists of:</p> <ul style="list-style-type: none"> <li>- energy control procedures</li> <li>- personnel training</li> <li>- periodic inspections.</li> </ul>
<p><b>LT.10.2.</b> Installations must use specific criteria in determining whether to use a lockout or tagout system (29 CFR 1910.147(c)(2)(i) and 1910.147(c)(2)(ii)).</p>	<p>Verify that, if an energy isolating device can be locked out, the energy control program uses a lockout system.</p> <p>(NOTE: This requirement does not apply if the installation can demonstrate that a tagout system will provide full employee protection as outlined in 29 CFR 1910.147(c)(3) (see checklist item LT.10.4).)</p> <p>Verify that, if an energy isolating device cannot be locked out, the energy control program uses a tagout system.</p>
<p><b>LT.10.3.</b> Under specific circumstances, energy isolating devices must be designed to accept a lockout device (29</p>	<p>Verify that, whenever replacement, major repair, renovation, or modification of a machine or equipment is performed, the energy isolating devices for such machines and equipment are designed to accept a lockout device.</p>

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<p>CFR 1910.147(c)(2)(iii)).</p> <p><b>LT.10.4.</b> Installations must meet specific requirements when using a tagout device on an energy isolating device that can be locked out (29 CFR 1910.147(c)(3)).</p> <p><b>LT.10.5.</b> Installations must develop, document, and utilize procedures for the control of potentially hazardous energy (29 CFR 29 1910.147(c)(4)(i)).</p> <p><b>LT.10.6.</b> Procedures for controlling potentially hazardous energy must meet certain requirements (29 CFR 1910.147(c)(4)(ii)).</p>	<p>Verify that when new machines or equipment are installed, the energy isolating devices for such machines and equipment are designed to accept a lockout device.</p> <p>Verify that the installation attaches the tagout device to the energy isolating device at the location where the lockout device would have been attached.</p> <p>Verify that the installation can demonstrate that the tagout program provides the same level of safety as that afforded by a lockout program by showing the following:</p> <ul style="list-style-type: none"> <li>- full compliance with all tagout-related provisions</li> <li>- implementation of safety measures, such as removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or removal of a valve handle, which reduce the likelihood of inadvertent energizing.</li> </ul> <p>Verify that the installation documents and follows procedures for the control of potentially hazardous energy.</p> <p>(NOTE: The installation does <i>not</i> need to document the procedures for a particular machine or piece of equipment when all of the following conditions exist:</p> <ul style="list-style-type: none"> <li>- the machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shutdown that could endanger personnel</li> <li>- the machine or equipment has a single energy source which can be readily identified and isolated</li> <li>- the isolation and locking-out of this single energy source will completely de-energize and deactivate the machine or equipment</li> <li>- the machine or equipment is isolated from this single energy source and locked out during servicing or maintenance</li> <li>- a single lockout device will achieve a locked-out condition</li> <li>- the lockout device is under the exclusive control of the authorized personnel performing the servicing or maintenance</li> <li>- the servicing or maintenance does not create hazards for other personnel</li> <li>- the installation, in utilizing this exception, has had no accidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.)</li> </ul> <p>Verify that installation procedures clearly and specifically outline the scope, purpose, authorization, rules, and techniques for controlling hazardous energy, including:</p> <ul style="list-style-type: none"> <li>- a statement of the intended use of each procedure</li> <li>- procedural steps for shutting down, isolating, blocking, and securing machines or equipment</li> <li>- procedural steps for placing, removing, and transferring lockout or tagout devices and the responsibility for these devices</li> </ul>

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<p><b>LT.10.7.</b> Installations must provide appropriate hardware for isolating, securing, or blocking machines or equipment from energy sources (29 CFR 1910.147(c)(5)(i)).</p> <p><b>LT.10.8.</b> Lockout and tagout devices must meet specific requirements (29 CFR 1910.147(c)(5)(ii)).</p> <p><b>LT.10.9.</b> Lockout and tagout devices must be sufficiently durable (29 CFR 1910.147(c)(5)(ii)).</p> <p><b>LT.10.10.</b> Installations must standardize lockout and tagout devices according to specific criteria (29 CFR 1910.147(c)(5)(ii)).</p> <p><b>LT.10.11.</b> Lockout and tagout devices must be sufficiently substantial (29 CFR 1910.147(c)(5)(ii)).</p>	<p>- requirements for testing a machine or equipment to determine the effectiveness of lockout and tagout devices and other energy control measures.</p> <p>Verify that installation procedures clearly and specifically outline means of enforcing compliance.</p> <p>Verify that the installation provides locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware to secure or block machines and equipment from energy sources.</p> <p>Verify that lockout and tagout devices are singularly identified.</p> <p>Verify that the installation uses lockout and tagout devices only for energy control and that it does not use other devices for this purpose.</p> <p>Verify that lockout and tagout devices can withstand the environment to which they are exposed for the maximum period of time that exposure is expected.</p> <p>Verify that tagout devices are constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.</p> <p>Verify that tags will not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.</p> <p>Verify that the installation standardizes its lockout and tagout devices according to color, shape, or size.</p> <p>Verify that the installation standardizes the print and format of its tagout devices.</p> <p>Verify that lockout devices are substantial enough to prevent their removal without the use of excessive force or unusual techniques, such as by bolt cutters or other metal cutting tools.</p> <p>Verify that tagout devices, including their means of attachment, are substantial enough to prevent their inadvertent or accidental removal.</p> <p>Verify that the means of attaching tagout devices are:</p> <ul style="list-style-type: none"> <li>- of a nonreusable type</li> <li>- attachable by hand</li> <li>- self-locking</li> <li>- nonreleasable.</li> </ul>

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<p><b>LT.10.12.</b> Lockout and tagout devices must indicate the identity of the personnel who apply them (29 CFR 1910.147(c) (5)(ii)).</p> <p><b>LT.10.13.</b> Tagout devices must warn against hazardous conditions should the machine or equipment be energized (29 CFR 1910.147(c) (5)(iii)).</p> <p><b>LT.10.14.</b> Installations must conduct periodic inspections of energy control procedures (29 CFR 1910.147(c)(6)(i)).</p> <p><b>LT.10.15.</b> Where lock-out is used for energy control, inspections must meet specific requirements (29 CFR 1910.147(c) (6)(I)).</p> <p><b>LT.10.16.</b> Where tagout is used for energy control, inspections must meet specific requirements (29 CFR 1910.147(c)(6)(i)).</p> <p><b>LT.10.17.</b> Installations must certify that energy control</p>	<p>Verify that the means of attaching tagout devices have a minimum unlocking strength of at least 50 lb and the basic design and characteristics of at least a one-piece, all-environment-tolerant nylon cable tie.</p> <p>Verify that lockout and tagout devices identify the personnel who apply them.</p> <p>Verify that tagout devices warn against the hazardous conditions that may result if a machine or piece of equipment is energized.</p> <p>Verify that tagout devices include a legend such as the following: DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, DO NOT OPERATE.</p> <p>Verify that the installation inspects its energy control procedure at least annually to determine compliance with lockout/tagout standards.</p> <p>Verify that inspections are conducted by authorized personnel who do not work with the energy control procedures they are inspecting.</p> <p>Verify that inspections address the correction of identified deviations or inadequacies.</p> <p>Determine whether the installation uses lockout for energy control.</p> <p>Verify that inspections include a review, between the inspector and authorized individual, of that individual's responsibilities under the energy control procedure being inspected.</p> <p>Determine whether the installation uses tagout for energy control.</p> <p>Verify that inspections include a review, between the inspector and each authorized and affected individual, of that individual's responsibilities under the energy control procedure being inspected.</p> <p>Verify that inspections include a review of authorized and affected personnel to ensure they meet the requirements of 29 CFR 1910.147(c)(7)(ii) (see checklist item LT.10.19).</p> <p>Verify that the installation certifies it has performed inspections of energy control</p>

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<p>procedure inspections have been performed (29 CFR 1910.147(c) (6)(ii)).</p> <p><b>LT.10.18.</b> Installations must provide training to ensure that personnel understand the purpose and function of the energy control program and to teach skills for the safe application, use, and removal of energy controls (29 CFR 1910.147(c) (7)(i)).</p> <p><b>LT.10.19.</b> Where tagout is used for energy control, personnel must be trained in the limitations of tags (29 CFR 1910.147(c)(7) (ii)).</p> <p><b>LT.10.20.</b> Installations must provide adequate retraining for personnel under specific circumstances (29 CFR 1910.147(c) (7)(iii)).</p>	<p>procedure and that such certification identifies:</p> <ul style="list-style-type: none"> <li>- the machine or equipment for which the energy control procedure was used</li> <li>- the date of inspection</li> <li>- the personnel included in the inspection</li> <li>- the individual who performed the inspection.</li> </ul> <p>Verify that authorized personnel receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation.</p> <p>Verify that affected personnel are instructed in the use and purpose of the energy control procedure.</p> <p>Verify that personnel who work near areas where energy control procedures are used are instructed about the procedures and the prohibition relating to attempts to restart or re-energize machines that are locked out or tagged out.</p> <p>Verify that personnel are given the following instructions concerning tags:</p> <ul style="list-style-type: none"> <li>- Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical restraint afforded by locks</li> <li>- When a tag is attached to an energy isolating device, it is not to be removed without permission of the authorized individual responsible for it and is never to be bypassed, ignored, or otherwise defeated</li> <li>- In order to be effective, tags must be legible and understandable by all authorized personnel, affected personnel, and all other personnel who work in or near the area</li> <li>- Tags and their means of attachment must be constructed of materials that can withstand the environmental conditions encountered in the workplace.</li> <li>- Tags may evoke a false sense of security</li> <li>- Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.</li> </ul> <p>Verify that the installation provides retraining for authorized and affected personnel whenever there is a change in:</p> <ul style="list-style-type: none"> <li>- job assignment</li> <li>- energy control procedures</li> <li>- machines, equipment, or processes that presents a new hazard.</li> </ul> <p>Verify that the installation provides retraining whenever a periodic inspection reveals, or whenever there is reason to believe, that there are deviations from, or inadequacies in an individual's knowledge or use of, energy control procedures.</p> <p>Verify that retraining re-establishes personnel proficiency and introduces new or</p>

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<p><b>LT.10.21.</b> Installations must notify affected personnel of the application or removal of lockout or tagout devices (29 CFR 1910.147(c)(9)).</p> <p><b>LT.10.22.</b> Lockout or tagout must be performed only by the authorized personnel who are performing the service or maintenance (29 CFR 1910.147(c)(8) and 1910.147(d)).</p> <p><b>LT.10.23.</b> Authorized personnel must have specific information before shutting down machines or equipment (29 CFR 1910.147(d)(1)).</p> <p><b>LT.10.24.</b> Machines or equipment must be shut down according to specific guidelines (29 CFR 1910.147(d)(2)).</p> <p><b>LT.10.25.</b> Machines or equipment must be isolated from the energy source (29 CFR 1910.147(d)(3)).</p> <p><b>LT.10.26.</b> Lockout or tagout devices must be affixed to energy isolating devices according to specific requirements (29 CFR 1910.147(d)(4)(i) through 1910.147(d)(4)(iii)).</p>	<p>revised control methods and procedures, as needed.</p> <p>Verify that the installation maintains certification of training, including the names of personnel and dates of their training.</p> <p>Verify that either the installation or an authorized individual notifies affected personnel of the application or removal of lockout or tagout devices and that such notification is made before the devices are applied to, or removed from, the machine or equipment.</p> <p>(NOTE: The application of energy control (lockout and tagout procedures) must be done in the sequence indicated by the order of 29 CFR 1910.147(d) (see checklist items LT.10.24 through LT.10.29). For a sample lockout procedure, see Appendix A to 29 CFR 1910.147.)</p> <p>Verify that lockout or tagout is performed only by the authorized personnel who are performing the servicing or maintenance.</p> <p>Verify that authorized or affected personnel have the following information before turning off a machine or equipment:</p> <ul style="list-style-type: none"> <li>- type and magnitude of the energy</li> <li>- hazards of the energy to be controlled</li> <li>- method or means of controlling the energy.</li> </ul> <p>Verify that machines or equipment are shut down according to the procedures established for such machines or equipment in a way that avoids additional or increased hazards to personnel as the result of equipment stoppage.</p> <p>Verify that all energy isolating devices needed to control the energy to the machine or equipment are physically located and operated so as to isolate the machine or equipment from the energy source.</p> <p>Verify that only authorized personnel affix lockout or tagout devices to energy isolating devices.</p> <p>Verify that lockout devices, where used, are affixed in a manner that holds the energy isolating devices in a <i>safe</i> or <i>off</i> position.</p> <p>Verify that tagout devices, where used, are affixed in a manner that indicates that the operation or movement of energy isolating devices from the <i>safe</i> or <i>off</i> position is prohibited.</p>

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<p><b>LT.10.27.</b> Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy must be relieved, disconnected, restrained, and otherwise rendered safe (29 CFR 1910.147(d)(5) (i) and 1910.147(d)(5) (ii)).</p> <p><b>LT.10.28.</b> Before work begins on machines or equipment that have been locked out or tagged out, authorized personnel must establish that isolation and de-energizing have been accomplished (29 CFR 1910.147(d)(6)).</p> <p><b>LT.10.29.</b> Authorized personnel must follow specific procedures before removing lockout or tagout devices and restoring energy to machines and equipment (29 CFR 1910.147(e)(1), 1910.147(e)(2)(i), and 1910.147(e)(2)(ii)).</p> <p><b>LT.10.30.</b> Each lockout or tagout device must be removed from each energy isolating device by the authorized individual who applied the device (29 CFR 1910.147(e)(3)).</p>	<p>Verify that, where tagout devices are used with energy isolating devices that can be locked out, the tag attachment is fastened at the same point at which a lock would have been attached.</p> <p>Verify that, if a tag cannot be affixed directly to an energy isolating device, the tag is located as close as possible to the device, in a position that is immediately obvious to any person attempting to operate the machine or equipment.</p> <p>Verify that, following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy is relieved, disconnected, restrained, and otherwise rendered safe.</p> <p>Verify that, if there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation continues until servicing or maintenance is completed or until the possibility of such reaccumulation no longer exists.</p> <p>Verify that, before work begins on machines or equipment that have been locked or tagged out, authorized personnel determine whether that isolation and de-energizing of the machine or equipment have been accomplished.</p> <p>Verify that, before lockout or tagout devices are removed and energy restored, authorized personnel inspect the work area to ensure that:</p> <ul style="list-style-type: none"> <li>- nonessential items have been removed</li> <li>- machine or equipment components are operationally intact</li> <li>- all personnel have been safely positioned or removed.</li> </ul> <p>Verify that, after lockout or tagout devices have been removed and before a machine or equipment is started, affected personnel are notified that the lockout or tagout devices have been removed.</p> <p>Verify that each lockout or tagout device is removed from each energy isolating device only by the authorized individual who applied the device.</p> <p>(NOTE: When the authorized individual who applied a lockout or tagout device is not available to remove it, the installation may direct its removal, provided that it meets the requirements outlined in the next checklist item.)</p>

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<p><b>LT.10.31.</b> If the authorized individual who applied a lockout or tagout device is not available to remove it, the installation must meet specific requirements for its removal (29 CFR 1910.147(e)(3) and 1910.147(e)(3)(i) through 1910.147(e)(3) (iii)).</p>	<p>Verify that the installation has developed and documented specific training and procedures for the removal of the lockout or tagout device in the absence of the authorized individual and that such training and procedures are incorporated into the energy control program.</p> <p>Verify that the installation can demonstrate that its procedures provide equivalent safety to the removal of the device by the authorized individual and that these procedures include:</p> <ul style="list-style-type: none"> <li>- verification that the authorized individual who applied the lockout or tagout device is not present at the installation</li> <li>- the exertion of all reasonable efforts to contact the authorized individual to inform him or her that the lockout or tagout device has been removed</li> <li>- assurance that the authorized individual is aware of the removal before returning to work at the installation.</li> </ul>
<p><b>LT.10.32.</b> When lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized for testing or positioning, specific procedures must be followed (29 CFR 1910.147(f)(1) and 1910.147(f)(1)(i) through 1910.147(f)(1)(v)).</p>	<p>Verify that authorized personnel perform the following actions in sequence:</p> <ul style="list-style-type: none"> <li>- clear the machine or equipment of nonessential tools and materials</li> <li>- remove personnel from the work area</li> <li>- remove lockout or tagout devices in accordance with the requirements in checklist items LT.10.31 and LT.10.32</li> <li>- energize and proceed with testing or positioning</li> <li>- de-energize all systems and reapply energy control measures in accordance with the requirements outlined in 29 CFR 1910.147(d) (see checklist items LT.10.24 through LT.10.29) to continue the servicing and/or maintenance.</li> </ul>
<p><b>LT.10.33.</b> Installations must meet specific requirements when using contracting servicing personnel for work concerning the control of hazardous energy ((29 CFR 1910.147(f)(2)(i) and 1910.147(f)(2) (ii)).</p>	<p>Determine whether the installation uses contracting personnel in the control of hazardous energy.</p> <p>Verify that the installation and the employer(s) of contracting personnel inform one another of their respective lockout or tagout procedures.</p> <p>Verify that installation personnel understand and follow the restrictions and prohibitions of any outside employer's energy control program.</p>
<p><b>LT.10.34.</b> Groups performing servicing and/or maintenance of lockout or tagout devices must meet specific requirements (29 CFR 1910.147(f)(3)(i)).</p>	<p>Determine whether the installation uses crews, crafts, departments, or other groups to service and/or maintain its lockout or tagout devices.</p> <p>Verify that any group performing maintenance and/or service of lockout or tagout devices follows procedures that ensure the equivalent level of protection to that provided by a personal lockout or tagout service.</p>

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<p><b>LT.10.35.</b> Group lockout or tagout devices must be used according to specific requirements (29 CFR 1910.147(f)(3)(ii)).</p> <p><b>LT.10.36.</b> Installations must meet specific requirements during shift or personnel changes to ensure the continuity of lockout/tagout protection (29 CFR 1910.147(f)(4)).</p>	<p>Verify that group lockout or tagout devices are used in accordance with the procedures required under 29 CFR 1910.147(c)(4) (see checklist items LT.10.5 and LT.10.6).</p> <p>Verify that primary responsibility is vested in an authorized individual for a set number of personnel working under the protection of a group lockout or tagout device (such as an operations lock).</p> <p>Verify that the responsible authorized individual can ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment.</p> <p>Verify that, when more than one group (i.e., crew, craft, department, etc.) is involved, an authorized individual designated to coordinate affected personnel and ensure continuity of protection is assigned responsibility for overall job-associated lockout or tagout control</p> <p>Verify that each authorized individual affixes a personal lockout or tagout device to the group lockout device, lockbox, or comparable mechanism when he or she begins work and removes such device when he or she stops working on the machine or equipment being serviced.</p> <p>Verify that the installation provides procedures for the orderly transfer of lockout or tagout device protection between offgoing and oncoming personnel.</p>



## **CHAPTER 47**

### **FIRE PROTECTION**

## CHAPTER 47

### SAFETY: FIRE PROTECTION

#### ECAMP-ANG

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#### Compliance Definitions

- *Approved* - regarding fire protection, approved means acceptable to the Assistant Secretary under the following criteria (29 CFR 1910.156(c)(3)):
  - if it is accepted, or certified, or listed, or labeled or otherwise determined to be safe by a nationally recognized testing laboratory or
  - with respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency and found in compliance with the provisions of the applicable *National Fire Protection Association Fire Code* or
  - with respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by its manufacturer on the basis of test data which the installation keeps and makes available for inspection to the Assistant Secretary.

(NOTE: For the purposes of this definition:

- equipment is *listed* if it is of a kind mentioned in a list which is published by a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and which states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner
  - equipment is *labeled* if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment, and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner
  - equipment is *accepted* if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes
  - equipment is *certified* if it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and if it bears a label, tag, or other record of certification
  - refer to 29 CFR 1910.7 for a definition of *nationally recognized testing laboratory*).
- *Aqueous Film Forming Foam (AFFF)* - a fluorinated surfactant with a foam stabilizer which is diluted with water to act as a temporary barrier to exclude air from mixing with the fuel vapor by developing an aqueous film on the fuel surface of some hydrocarbons which is capable of suppressing the generation of fuel vapors (29 CFR 1910.156(c)(2)).
  - *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health or designee (29 CFR 1910.156(c)(4)).
  - *Carbon Dioxide* - a colorless, odorless, electrically nonconductive inert gas (chemical formula  $\text{CO}_2$ ) that is a medium for extinguishing fires by reducing the concentration of oxygen or fuel vapor in the air to the point where combustion is impossible (29 CFR 1910.156(c)(7)).
  - *Class A Fire* - a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials (29 CFR 1910.156(c)(8)).

- *Class B Fire* - a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials (29 CFR 1910.156(c)(9)).
- *Class C Fire* - a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media (29 CFR 1910.156(c)(10)).
- *Class D Fire* - a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium (29 CFR 1910.156(c)(11)).
- *Class I Standpipe System* - a 2.5 in. (6.3 cm) hose connection for use by fire departments and those trained in handling heavy fire streams (29 CFR 1910.156(c)(39)(i)).
- *Class II Standpipe System* - a 1.5 in. (3.8 cm) hose system which provides a means for the control or extinguishment of incipient stage fires (29 CFR 1910.156(c)(39)(ii)).
- *Class III Standpipe System* - a combined system of hose which is for the use of employees trained in the use of hose operations and which is capable of furnishing effective water discharge during the more advanced stages of fire (beyond the incipient stage) in the interior of workplaces. Hose outlets are available for both 1.5 in. (3.8 cm) and 2.5 in. (6.3 cm) hose (29 CFR 1910.156(c)(39)(iii)).
- *Dry Chemical* - an extinguishing agent composed of very small particles of chemicals such as, but not limited to, sodium bicarbonate, potassium bicarbonate, urea-based potassium bicarbonate, potassium chloride, or monoammonium phosphate supplemented by special treatment to provide resistance to packing and moisture absorption (caking) as well as to provide proper flow capabilities. *Dry chemical* does not include dry powders (29 CFR 1910.156(c)(12)).
- *Dry Powder* - a compound used to extinguish or control Class D fires (29 CFR 1910.156(c)(13)).
- *Education* - the process of imparting knowledge or skill through systematic instruction. It does not require formal classroom instruction (29 CFR 1910.156(c)(14)).
- *Extinguisher Classification* - the letter classification given an extinguisher to designate the class or classes of fire on which an extinguisher will be effective (29 CFR 1910.156(c)(16)).
- *Extinguisher Rating* - the numerical rating given to an extinguisher which indicates the extinguishing potential of the unit based on standardized tests developed by Underwriters' Laboratories, Inc. (29 CFR 1910.156(c)(17)).
- *Foam* - a stable aggregation of small bubbles which flow freely over a burning liquid surface and form a coherent blanket which seals combustible vapors and thereby extinguishes the fire (29 CFR 1910.156(c)(21)).
- *Gaseous Agent* - a fire extinguishing agent which is in the gaseous state at normal room temperature and pressure. It has low viscosity, can expand or contract with changes in pressure and temperature, and has the ability to diffuse readily and to distribute itself uniformly throughout an enclosure (29 CFR 1910.156(c)(22)).
- *Halon 1211* - a colorless, faintly sweet smelling, electrically nonconductive liquefied gas (chemical formula  $\text{CBrClF}_2$ ) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromochlorodifluoromethane (29 CFR 1910.156(c)(23)).
- *Halon 1301* - a colorless, odorless, electrically nonconductive gas (chemical formula  $\text{CBrF}_3$ ) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromotrifluoromethane (29 CFR 1910.156(c)(24)).

- *Incipient Stage Fire* - a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus (29 CFR 1910.156(c)(26)).
- *Inspection* - a visual check of fire protection systems and equipment to ensure that they are in place, charged, and ready for use in the event of a fire (29 CFR 1910.156(c)(27)).
- *Maintenance* - the performance of services on fire protection equipment and systems to ensure that they will perform as expected in the event of a fire. Maintenance differs from inspection in that maintenance requires the checking of internal fittings, devices and agent supplies (29 CFR 1910.156(c)(31)).
- *Multipurpose Dry Chemical* - a dry chemical which is approved for use on Class A, Class B, and Class C fires (29 CFR 1910.156(c)(32)).
- *Small Hose System* - a system of hose ranging in diameter from 5/8 in. (1.6 cm) up to 1.5 in. (3.8 cm) which is for the use of employees and which provides a means for the control and extinguishment of incipient stage fires (29 CFR 1910.156(c)(39)(iv)).
- *Sprinkler System* - a system of piping designed in accordance with fire protection engineering standards and installed to control or extinguish fires. The system includes an adequate and reliable water supply, and a network of specially sized piping and sprinklers which are interconnected. The system also includes a control valve and a device for actuating an alarm when the system is in operation (29 CFR 1910.156(c)(38)).
- *Training* - the process of making proficient through instruction and hands-on practice in the operation of equipment, including respiratory protection equipment, that is expected to be used and in the performance of assigned duties (29 CFR 1910.156(c)(41)).



**SAFETY: FIRE PROTECTION**  
**GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Portable Fire Extinguishers	FP.10.1 through FP.10.7	47-7
Standpipe and Hose Systems	FP.20.1 through FP.20.5	47-13

<i>Appendix 47-1, Hydrostatic Test Intervals for Portable Fire Extinguishers</i>	47-17
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**REVIEWER CHECKS:**  
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## **FP.10 PORTABLE FIRE EXTINGUISHERS**

(NOTE: The requirements of 29 CFR 1910.157 (see the checklist items in FP.10) apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees.)

(NOTE: Where extinguishers are provided but are not intended for employee use and the installation has an emergency action plan and a fire prevention plan which meet the requirements of 29 CFR 1910.38 (see the checklist items in ME.30), then only the requirements of 29 CFR 1910.157(e) (see checklist item FP.10.3) and 29 CFR 1910.157(f) (see checklist items FP.10.4 through FP.10.6) apply.)

(NOTE: Where the installation has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 29 CFR 1910.38 (see the checklist items in ME.30), and when extinguishers are not available in the workplace, the installation is exempt from all requirements of 29 CFR 1910.157 (see the checklist items in FP.10) unless a specific standard in part 1910 requires that a portable fire extinguisher be provided.)

**FP.10.1.** Installations must satisfy certain general requirements regarding portable fire extinguishers (29 CFR 1910.157(c)).

Verify that the installation provides portable fire extinguishers and mounts, locates, and identifies them so that they are readily accessible to employees without subjecting the employees to possible injury.

Verify that only approved portable fire extinguishers are used to meet the requirements of 29 CFR 1910.157 (see the checklist items in FP.10).

Verify that the installation does not provide or make available in the workplace portable fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents.

Verify that the installation ensures that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times.

(NOTE: This requirement does not apply when the portable fire extinguishers are in use.)

Verify that the installation has permanently removed from service all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

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<b>FP.10.2.</b> Installations must select and distribute portable fire extinguishers according to certain requirements (29 CFR 1910.157(d)).	<p>(NOTE: This checklist item does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures.)</p> <p>(NOTE: Where the installation has an emergency action plan meeting the requirements of 29 CFR 1910.38 (see the checklist items in ME.30) which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the installation is exempt from the distribution requirements in this checklist item.)</p> <p>Verify that portable fire extinguishers are provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use.</p> <p>Verify that the installation distributes portable fire extinguishers for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 ft (22.9 m) or less.</p> <p>(NOTE: The installation may use uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers, provided that such systems:</p> <ul style="list-style-type: none"> <li>- meet the respective requirements of 29 CFR 1910.158 (see checklist items FP.20) or 1910.159</li> <li>- provide total coverage of the area to be protected and</li> <li>- employees are trained at least annually in their use.)</li> </ul> <p>Verify that the installation distributes portable fire extinguishers for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 ft (15.2 m) or less.</p> <p>Verify that the installation distributes portable fire extinguishers used for Class C hazards on the basis of the appropriate pattern of the existing Class A or Class B hazards.</p> <p>Verify that the installation distributes portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal working area to any extinguishing agent is 75 ft (22.9 m) or less.</p> <p>Verify that portable fire extinguishers for Class D hazards are provided in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every 2 wk.</p> <p>(NOTE: The installation is responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.)</p>
<b>FP.10.3.</b> The inspection, maintenance, and testing of portable fire extinguishers	<p>(NOTE: The installation is responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.)</p>

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<p>must satisfy certain requirements (29 CFR 1910.157(e)).</p> <p><b>FP.10.4.</b> Installations must ensure that hydrostatic testing satisfies certain requirements (29 CFR 1910.157(f)(1) through 1910.157(f)(14)).</p>	<p>Verify that portable extinguishers or hose used in lieu thereof under 29 CFR 1910.157(d)(3) (see checklist item FP.10.2) are visually inspected monthly.</p> <p>Verify that the installation ensures that portable fire extinguishers are subjected to an annual maintenance check.</p> <p>(NOTE: Stored pressure extinguishers do not require an internal examination.)</p> <p>Verify that the installation records the annual maintenance date and retains this record for one year after the last entry or the life of the shell, whichever is less.</p> <p>Verify that the record is available to the Assistant Secretary upon request.</p> <p>Verify that the installation ensures that stored pressure dry chemical extinguishers that require a 12-yr hydrostatic test are emptied and subjected to applicable maintenance procedures every 6 yr.</p> <p>(NOTE: Dry chemical extinguishers having non-refillable disposable containers are exempt from this requirement.)</p> <p>(NOTE: When recharging or hydrostatic testing is performed, the 6-yr requirement begins from that date.)</p> <p>Verify that the installation ensures that alternate equivalent protection is provided when portable fire extinguishers are removed from service for maintenance and recharging.</p> <p>Verify that the installation ensures that hydrostatic testing is performed by trained persons with suitable testing equipment and facilities.</p> <p>Verify that the installation ensures that portable extinguishers are hydrostatically tested at intervals listed in Appendix 47-1.</p> <p>(NOTE: This hydrostatic testing requirement does not apply under any of the following conditions:</p> <ul style="list-style-type: none"> <li>- when the unit has been repaired by soldering, welding, brazing, or use of patching compounds</li> <li>- when the cylinder or shell threads are damaged</li> <li>- when there is corrosion that has caused pitting, including corrosion under removable name plate assemblies</li> <li>- when the extinguisher has been burned in a fire or</li> <li>- when calcium chloride extinguishing agent has been used in a stainless steel shell.)</li> </ul> <p>Verify that, in addition to an external visual examination, the installation ensures that an internal examination of cylinders and shells to be tested is made prior to</p>

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	<p>the hydrostatic tests.</p> <p>Verify that the installation ensures that portable fire extinguishers are hydrostatically tested whenever they show new evidence of corrosion or mechanical injury.</p> <p>(NOTE: This requirement does not apply under any of the following conditions:</p> <ul style="list-style-type: none"> <li>- when the unit has been repaired by soldering, welding, brazing, or use of patching compounds</li> <li>- when the cylinder or shell threads are damaged</li> <li>- when there is corrosion that has caused pitting, including corrosion under removable name plate assemblies</li> <li>- when the extinguisher has been burned in a fire or</li> <li>- when calcium chloride extinguishing agent has been used in a stainless steel shell.)</li> </ul> <p>Verify that the installation ensures that hydrostatic tests are performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose.</p> <p>Verify that the test interval for such a hose assembly is the same as specified for the extinguisher on which the hose is installed.</p> <p>Verify that the installation ensures that carbon dioxide hose assemblies with a shut-off nozzle are hydrostatically tested at 1250 psi (8620 kPa).</p> <p>Verify that the installation ensures that dry chemical and dry powder hose assemblies with a shut-off nozzle are hydrostatically tested at 300 psi (2070 kPa).</p> <p>(NOTE: Hose assemblies passing a hydrostatic test do not require any type of recording or stamping.)</p> <p>Verify that the installation ensures that hose assemblies for carbon dioxide extinguishers that require a hydrostatic test are tested within a protective cage device.</p> <p>Verify that the installation ensures that carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers are tested every 5 yr at 5/3 of the service pressure as stamped into the cylinder.</p> <p>(NOTE: Nitrogen cylinders which comply with 49 CFR 173.34(e)(15) may be hydrostatically tested every 10 yr.)</p> <p>Verify that the installation ensures that all stored pressure and Halon 1211 types of extinguishers are hydrostatically tested at the factory test pressure not to exceed two times the service pressure.</p> <p>Verify that the installation ensures that acceptable self-generating type soda acid</p>

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<p><b>FP.10.5.</b> The equipment used for testing of cylinders must satisfy certain requirements (29 CFR 1910.157(f)(15)).</p>	<p>and foam extinguishers are tested at 350 psi (2410 kPa).</p> <p>Verify that air or gas pressure is not used for hydrostatic testing.</p> <p>Verify that extinguisher shells, cylinders, or cartridges which are not fit for testing are removed from service and from the workplace.</p> <p>Verify that the equipment for testing compressed gas type cylinders is of the water jacket type.</p> <p>Verify that the equipment is provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or 0.1 cc (0.1 mL) of liquid.</p> <p>Verify that the equipment for testing non-compressed gas type cylinders consists of the following:</p> <ul style="list-style-type: none"> <li>- a hydrostatic test pump, hand or power operated, capable of producing not less than 150 percent of the test pressure, which includes appropriate check valves and fittings</li> <li>- a flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable</li> <li>- a protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test.</li> </ul> <p><b>FP.10.6.</b> Evidence of hydrostatic testing of fire extinguishers must satisfy certain requirements (29 CFR 1910.157(f)(16)).</p> <p>Verify that the installation maintains and provides upon request to the Assistant Secretary evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Appendix 47-1.</p> <p>Verify that such evidence is in the form of a certification record which includes:</p> <ul style="list-style-type: none"> <li>- the date of the test</li> <li>- the signature of the person who performed the test</li> <li>- the serial number, or other identifier, of the fire extinguisher that was tested.</li> </ul> <p>Verify that such records are kept until the extinguisher is hydrostatically retested at the time interval specified in Appendix 47-1 or until the extinguisher is taken out of service, whichever comes first.</p> <p><b>FP.10.7.</b> Installations must provide training and education that meets certain requirements (29 CFR 1910.157(g)).</p> <p>Verify that, where the installation has provided portable fire extinguishers for employee use in the workplace, the installation also provides an educational program to familiarized employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.</p>

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	<p>Verify that the installation provides such education upon initial employment and at least annually thereafter.</p> <p>Verify that the installation provides employees who have been designated to use fire fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.</p> <p>Verify that the installation provides such training required upon initial assignment to the designated group of employees and at least annually thereafter.</p>

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<p><b>FP.20 STANDPIPE AND HOSE SYSTEMS</b></p> <p><b>FP.20.1.</b> Installations must ensure the protection of standpipes against mechanical damage (29 CFR 1910.158(b)).</p> <p><b>FP.20.2.</b> Standpipe equipment must satisfy certain requirements (29 CFR 1910.158(c)).</p>	<p>(NOTE: 29 CFR 1910.158 (see the checklist items in FP.20) applies to all small hose, Class II, and Class III standpipe systems installed to meet the requirements of a particular OSHA standard.)</p> <p>(NOTE: 29 CFR 1910.158 (see the checklist items in FP.20) does not apply to Class I standpipe systems.)</p> <p>Verify that the installation ensures that standpipes are located or otherwise protected against mechanical damage.</p> <p>Verify that damaged standpipes are repaired promptly.</p> <p>Verify that, where reels or cabinets are provided to contain fire hose, the installation ensures that they are designed to facilitate prompt use of the hose valves, the hose, and other equipment at the time of a fire or other emergency.</p> <p>Verify that the installation ensures that the reels and cabinets are conspicuously identified and used only for fire equipment.</p> <p>Verify that the installation ensures that hose outlets and connections are located high enough above the floor:</p> <ul style="list-style-type: none"> <li>- to avoid being obstructed, and</li> <li>- to be accessible to employees.</li> </ul> <p>Verify that the installation standardizes screw threads or provides appropriate adapters throughout the system and ensures that the hose connections are compatible with those used on the supporting fire equipment.</p> <p>Verify that the installation ensures that every 1.5 in. (3.8 cm) or smaller hose outlet used to meet this standard is equipped with hose connected and ready for use.</p> <p>(NOTE: In extremely cold climates where such installation may result in damaged equipment, the hose may be stored in another location provided it is readily available and can be connected when needed.)</p> <p>Verify that standpipe systems installed after 1 January 1981, for use by employees, are equipped with lined hose.</p> <p>(NOTE: Unlined hose may remain in use on existing systems.)</p>

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<p><b>FP.20.3.</b> The water supply for standpipe and hose systems must satisfy certain minimum requirements (29 CFR 1910.158(d)).</p> <p><b>FP.20.4.</b> Installations must ensure that certain acceptance test requirements are met (29 CFR 1910.158(e)(1)).</p> <p><b>FP.20.5.</b> Installations must satisfy certain maintenance requirements (29 CFR 1910.158(e)(2)).</p>	<p>Verify that unlined hose which becomes unserviceable is replaced with lined hose.</p> <p>Verify that the installation provides hose of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (210 kPa).</p> <p>Verify that the dynamic pressure at the nozzle is within the range of 30 psi (210 kPa) to 125 psi (860 kPa).</p> <p>Verify that the installation ensures that standpipe hose is equipped with shut-off type nozzles.</p> <p>Verify that the minimum water supply for standpipe and hose systems which are provided for the use of employees, is sufficient to provide 100 gal/min (6.3 L/s) for a period of at least 30 min.</p> <p>Verify that the installation ensures that the piping of Class II and Class III systems installed after 1 January 1981, including yard piping, is hydrostatically tested for a period of at least 2 h at least 50 psi (340 kPa) in excess of normal pressure when such pressure is greater than 150 psi (1030 kPa).</p> <p>Verify that the installation ensures that hose on all standpipe systems, installed after 1 January 1981, is hydrostatically tested with couplings in place, at a pressure of not less than 200 psi (1380 kPa), before it is placed in service.</p> <p>Verify that this pressure is maintained for at least 15 s and not more than 1 min.</p> <p>Verify that during this time:</p> <ul style="list-style-type: none"> <li>- the hose does not leak</li> <li>- no jacket thread breaks during the test.</li> </ul> <p>Verify that the installation ensures that water supply tanks are kept filled to the proper level.</p> <p>(NOTE: This requirement does not apply during repairs.)</p> <p>Verify that, when pressure tanks are used, the installation ensures that proper pressure is maintained at all times.</p> <p>(NOTE: This requirement does not apply during repairs.)</p>

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	<p>Verify that the installation ensures that valves in the main piping connections to the automatic sources of water supply are kept fully open at all times.</p> <p>(NOTE: This requirement does not apply during repair.)</p> <p>Verify that the installation ensures that hose systems are inspected at least annually and after each use to ensure that all of the equipment and hose are in place, available for use, and in serviceable condition.</p> <p>Verify that, when the system or any portion thereof is found not to be serviceable, the installation removes it from service immediately and replaces it with equivalent protection such as extinguishers and fire watches.</p> <p>Verify that the installation ensures that hemp or linen hose on existing systems is unracked, physically inspected for deterioration, and reracked using a different fold pattern at least annually.</p> <p>Verify that the installation ensures that defective hose is replaced with lined hose.</p> <p>Verify that the installation designates trained persons to conduct all inspections required under 29 CFR 1910.158 (see the checklist items in FP.20).</p>



## Appendix 47-1

### Hydrostatic Test Intervals for Portable Fire Extinguishers (29 CFR 1910.157, Table L-1)

Type of extinguishers	Test interval (years)
Soda acid (soldered brass shells) (until 1 January 1982)	( <sup>1</sup> )
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (soldered brass shells) (until 1 January 1982)	( <sup>1</sup> )
Foam (stainless steel shell)	5
Aqueous Film Forming foam (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Halon 1211	12
Halon 1301	12
Dry powder, cartridge or cylinder operated with mild steel shells	12

<sup>1</sup> Extinguishers having shells constructed of copper or brass joined by soft solder or rivets are not to be hydrostatically tested and are to have been removed from service by 1 January 1982.



## **CHAPTER 48**

### **MATERIALS HANDLING AND STORAGE**

## CHAPTER 48

### SAFETY: MATERIALS HANDLING AND STORAGE

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#### Compliance Definitions

- *Appointed* - assigned specific responsibilities by the installation or the installation's representative (29 CFR 1910.179(a)(15)).
- *Automatic Crane* - a crane which when activated operates through a preset cycle or cycles (29 CFR 1910.179(a)(2)).
- *Auxiliary Hoist* - a supplemental hoisting unit of lighter capacity and usually higher speed than provided for the main hoist (29 CFR 1910.179(a)(17)).
- *Barrier* - a fence, wall, or other structure or object placed between a single piece rim wheel and an employee during tire inflation, to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel (29 CFR 1910.177(b)).
- *Block* - a short block of wood, provided with a handle similar to that of a plane and a shoulder at the rear end, which is used for pushing short stock over revolving cutters (29 CFR 1910.211(a)(3)).
- *Brake* - a device used for retarding or stopping motion by friction or power means (29 CFR 1910.179(a)(18)).
- *Bridge* - that part of a crane consisting of girders, trucks, end ties, footwalks, and drive mechanism which carries the trolley or trolleys (29 CFR 1910.179(a)(21)).
- *Bridge Travel* - the crane movement in a direction parallel to the crane runway (29 CFR 1910.179(a)(22)).
- *Bumper (Buffer)* - an energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving cranes or trolleys come in contact (29 CFR 1910.179(a)(23)).
- *Cab* - the operator's compartment on a crane (29 CFR 1910.179(a)(24)).
- *Cab-operated Crane* - a crane controlled by an operator in a cab located on the bridge or trolley (29 CFR 1910.179(a)(3)).
- *Cantilever Gantry Crane* - a gantry or semigantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides (29 CFR 1910.179(a)(4)).
- *Charts* - the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled *Demounting and Mounting Procedures for Truck/Bus Tires* and *Multi-piece Rim Matching Chart*, the National Highway Traffic Safety Administration (NHTSA) publications entitled *Demounting and Mounting Procedures for Truck/Bus Tires* and *Multi-piece Rim Matching Chart*, or any other poster which contains at least the same instructions, safety precautions and other information contained in the charts that is applicable to the types of wheels being serviced (29 CFR 1910.177(b)).
- *Clearance* - the distance from any part of the crane to a point of the nearest obstruction (29 CFR 1910.179(a)(25)).

- *Collectors Current* - contacting devices for collecting current from runway or bridge conductors (29 CFR 1910.179(a)(26)).
- *Conductors' Bridge* - the electrical conductors located along the bridge structure of a crane to provide power to the trolley (29 CFR 1910.179(a)(27)).
- *Conductors' Runway (Main)* - the electrical conductors located along a crane runway to provide power to the crane (29 CFR 1910.179(a)(28)).
- *Control Braking Means* - a method of controlling crane motor speed when in an overhauling condition (29 CFR 1910.179(a)(29)).
- *Controller, Spring Return* - a controller which when released will return automatically to a neutral position (29 CFR 1910.179(a)(34)).
- *Countertorque* - a method of control by which the power to the motor is reversed to develop torque in the opposite direction (29 CFR 1910.179(a)(30)).
- *Crane* - a machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine. Cranes whether fixed or mobile are driven manually or by power (29 CFR 1910.179(a)(1)).
- *D* - units similar to the G units except that they are diesel engine powered instead of gasoline engine powered (29 CFR 1910.178(b)(1)).
- *Demounting [a Tire]* - the opposite of mounting a tire (29 CFR 1910.177(b)).
- *Designated* - selected or assigned by the installation or the installation's representative as being qualified to perform specific duties (29 CFR 1910.179(a)(35)).
- *Drag Brake* - a brake which provides retarding force without external control (29 CFR 1910.179(a)(19)).
- *Drift Point* - a point on a travel motion controller which releases the brake while the motor is not energized. This allows for coasting before the brake is set (29 CFR 1910.179(a)(36)).
- *Drum* - the cylindrical member around which the ropes are wound for raising or lowering the load (29 CFR 1910.179(a)(37)).
- *DS* - diesel powered units that are provided with additional safeguards to the exhaust, fuel and electrical systems. They may be used in some locations where a D unit may not be considered suitable (29 CFR 1910.178(b)(2)).
- *DY* - diesel powered units that have all the safeguards of the DS units and in addition do not have any electrical equipment including the ignition and are equipped with temperature limitation features (29 CFR 1910.178(b)(3)).
- *Dynamic* - a method of controlling crane motor speeds when in the overhauling condition to provide a retarding force (29 CFR 1910.179(a)(31)).
- *E* - electrically powered units that have minimum acceptable safeguards against inherent fire hazards (29 CFR 1910.178(b)(4)).

- *EE* - electrically powered units that have, in addition to all of the requirements for the E and ES units, the electric motors and all other electrical equipment completely enclosed. In certain locations the EE unit may be used where the use of an E and ES unit may not be considered suitable (29 CFR 1910.178(b)(6)).
- *Emergency Stop Switch* - a manually or automatically operated electric switch to cut off electric power independently of the regular operating controls (29 CFR 1910.179(a)(59)).
- *Equalizer* - a device which compensates for unequal length or stretch of a rope (29 CFR 1910.179(a)(38)).
- *ES* - electrically powered units that, in addition to all of the requirements for the E units, are provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures. They may be used in some locations where the use of an E unit may not be considered suitable (29 CFR 1910.178(b)(5)).
- *EX* - electrically powered units that differ from the E, ES, or EE units in that the electrical fittings and equipment are so designed, constructed and assembled that the units may be used in certain atmospheres containing flammable vapors or dusts (29 CFR 1910.178(b)(7)).
- *Exposed* - capable of being contacted inadvertently. Applied to hazardous objects not adequately guarded or isolated (29 CFR 1910.179(a)(39)).
- *Fail-Safe* - a provision designed to automatically stop or safely control any motion in which a malfunction occurs (29 CFR 1910.179(a)(40)).
- *Floor-operated Crane* - a crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform (29 CFR 1910.179(a)(5)).
- *Footwalk* - the walkway with handrail, attached to the bridge or trolley for access purposes (29 CFR 1910.179(a)(41)).
- *G* - gasoline powered units having minimum acceptable safeguards against inherent fire hazards (29 CFR 1910.178(b)(8)).
- *Gantry Crane* - a crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway (29 CFR 1910.179(a)(6)).
- *GS* - gasoline powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of a G unit may not be considered suitable (29 CFR 1910.178(b)(9)).
- *Hoist* - an apparatus which may be a part of a crane, exerting a force for lifting or lowering (29 CFR 1910.179(a)(42)).
- *Hoist Chain* - the load bearing chain in a hoist (29 CFR 1910.179(a)(43)).

(NOTE: Chain properties do not conform to those shown in ANSI B30.9-1971, *Safety Code for Slings*).

- *Hoist Motion* - that motion of a crane which raises and lowers a load (29 CFR 1910.179(a)(44)).
- *Holding Brake* - a brake that automatically prevents motion when power is off (29 CFR 1910.179(a)(20)).
- *Hot Metal Handling Crane* - an overhead crane used for transporting or pouring molten material (29 CFR 1910.179(a)(7)).

- *Installing a Rim Wheel* - the transfer and attachment of an assembled rim wheel onto a vehicle axle hub (29 CFR 1910.177(b)).
- *Limit Switch* - a device which is operated by some part or motion of a power-driven machine or equipment, the purpose of which is to cut off the power to the motor and apply the brake to stop the carrier in the event that a loaded step passes the terminal landing (29 CFR 1910.68(a)(4), 1910.179(a)(60)).
- *Load* - the total superimposed weight on the load block or hook (29 CFR 1910.179(a)(45)).
- *Load Block* - the assembly of hook or shackle, swivel, bearing, sheaves, pins, and frame suspended by the hoisting rope (29 CFR 1910.179(a)(46)).
- *LP* - similar to the G unit except that liquefied petroleum gas is used for fuel instead of gasoline (29 CFR 1910.178(b)(10)).
- *LPS* - liquefied petroleum gas powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of an LP unit may not be considered suitable (29 CFR 1910.178(b)(11)).
- *Magnet* - an electromagnetic device carried on a crane hook to pick up loads magnetically (29 CFR 1910.179(a)(47)).
- *Main Hoist* - the hoist mechanism provided for lifting the maximum rated load (29 CFR 1910.179(a)(48)).
- *Main Switch* - a switch controlling the entire power supply to the crane (29 CFR 1910.179(a)(61)).
- *Man Trolley* - a trolley having an operator's cab attached thereto (29 CFR 1910.179(a)(49)).
- *Master Switch* - a switch which dominates the operation of contactors, relays, or other remotely operated devices (29 CFR 1910.179(a)(62)).
- *Mechanical* - a method of control by friction (29 CFR 1910.179(a)(33)).
- *Mounting a Tire* - the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation (29 CFR 1910.177(b)).
- *Multi-Piece Rim Wheel* - the assemblage of a multi-piece wheel with the tire tube and other components (29 CFR 1910.177(b)).
- *Multi-Piece Wheel* - a vehicle wheel consisting of two or more parts one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated (29 CFR 1910.177(b)).
- *Overhead Crane* - a crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure (29 CFR 1910.179(a)(8)).
- *Power Operated Crane* - a crane whose mechanism is driven by electric, air, hydraulic, or internal combustion means (29 CFR 1910.179(a)(9)).
- *Pulpit-operated Crane* - a crane operated from a fixed operator station not attached to the crane (29 CFR 1910.179(a)(10)).
- *Rated Load* - the maximum load for which a piece of machinery is designed and built by the manufacturer and shown on the equipment nameplate(s) (29 CFR 1910.179(a)(50)).

- *Regenerative* - a form of dynamic braking in which the electrical energy generated is fed back into the power system (29 CFR 1910.179(a)(32)).
- *Remote-operated Crane* - a crane controlled by an operator not in a pulpit or in the cab attached to the crane, by any method other than pendant or rope control (29 CFR 1910.179(a)(11)).
- *Removing [a Rim Wheel]* - the opposite of installing a rim wheel (29 CFR 1910.177(b)).
- *Restraining Device* - an apparatus such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel (29 CFR 1910.177(b)).
- *Rim Manual* - a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced (29 CFR 1910.177(b)).
- *Rim Wheel* - an assemblage of tire, tube and liner (where appropriate), and wheel components (29 CFR 1910.177(b)).
- *Rope* - regarding overhead and gantry cranes, rope refers to wire rope, unless otherwise specified (29 CFR 1910.179(a)(51)).
- *Running Sheave* - a sheave which rotates as the load block is raised or lowered (29 CFR 1910.179(a)(52)).
- *Runway* - regarding overhead and gantry cranes, a runway is an assembly of rails, beams, girders, brackets, and framework on which the crane or trolley travels (29 CFR 1910.179(a)(53)).
- *Semigantry Crane* - a gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by a truck running on an elevated rail or runway (29 CFR 1910.179(a)(12)).
- *Service or Servicing* - regarding multi-piece and single piece rim wheels, the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling (29 CFR 1910.177(b)).
- *Service Area* - that part of an installation's premises used for the servicing of rim wheels, or any other place where an employee services rim wheels (29 CFR 1910.177(b)).
- *Side Pull* - that portion of the hoist pull acting horizontally when the hoist lines are not operated vertically (29 CFR 1910.179(a)(54)).
- *Single Piece Rim Wheel* - the assemblage of single piece rim wheel with the tire and other components (29 CFR 1910.177(b)).
- *Single Piece Wheel* - a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated (29 CFR 1910.177(b)).
- *Span* - the horizontal distance center to center of runway rails (29 CFR 1910.179(a)(55)).
- *Standby Crane* - a crane which is not in regular service but which is used occasionally or intermittently as required (29 CFR 1910.179(a)(56)).
- *Stop* - a device to limit travel of a trolley or crane bridge. This device normally is attached to a fixed structure and normally does not have energy absorbing ability (29 CFR 1910.179(a)(57)).

- *Storage Bridge Crane* - a gantry type crane of long span usually used for bulk storage of material; the bridge girders or trusses are rigidly or nonrigidly supported on one or more legs. It may have one or more fixed or hinged cantilever ends (29 CFR 1910.179(a)(13)).
- *Switch* - a device for making, breaking, or for changing the connections in an electric circuit (29 CFR 1910.179(a)(58)).
- *Trajectory* - any potential path or route that a rim wheel component may travel during an explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion (See Appendix A to 29 CFR 1910.177 for examples of trajectories) (29 CFR 1910.177(b)).
- *Trolley* - the unit which travels on the bridge rails and carries the hoisting mechanism (29 CFR 1910.179(a)(63)).
- *Trolley Travel* - the trolley movement at right angles to the crane runway (29 CFR 1910.179(a)(64)).
- *Truck* - the unit consisting of a frame, wheels, bearings, and axles which supports the bridge girders or trolleys (29 CFR 1910.179(a)(65)).
- *Wall Crane* - a crane having a jib with or without trolley and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the side wall or columns (29 CFR 1910.179(a)(14)).
- *Wheel* - that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/ or tube) (29 CFR 1910.177(b)).

## SAFETY: MATERIALS HANDLING AND STORAGE

### GUIDANCE FOR CHECKLIST USERS

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Handling Materials -- General	MS.10.1 through MS.10.6	48-9
Servicing Multi-piece and Single Piece Rim Wheels	MS.20.1 through MS.20.11	48-11
Powered Industrial Trucks	MS.30.1 through MS.30.18	48-17
Overhead and Gantry Cranes	MS.40.1 through MS.40.59	48-31

Appendix 48-1. *Summary Table on Use of Industrial Trucks in Various  
Locations*

See 29 CFR 1910.178,  
Table N-1



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<p><b>MS.10 HANDLING MATERIALS – GENERAL</b></p> <p><b>MS.10.1.</b> The use of mechanical equipment must satisfy certain requirements (29 CFR 1910.176(a)).</p> <p><b>MS.10.2.</b> Material must be securely stored (29 CFR 1910.176(b)).</p> <p><b>MS.10.3.</b> Housekeeping must satisfy certain requirements (29 CFR 1910.176(c)).</p> <p><b>MS.10.4.</b> Signs to warn of clearance limits must be provided (29 CFR 1910.176(e)).</p> <p><b>MS.10.5.</b> Derail and/or bumper blocks must be provided in certain circumstances (29 CFR 1910.176(f)).</p> <p><b>MS.10.6.</b> Covers and/or guardrails must be provided to protect personnel from certain hazards (29 CFR 1910.176(g)).</p>	<p>Verify that, where mechanical handling equipment is used, sufficient safe clearances are allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made.</p> <p>Verify that aisles and passageways are kept clear and in good repair, with no obstruction across or in aisles that could create a hazard.</p> <p>Verify that permanent aisles and passageways are appropriately marked.</p> <p>Verify that storage of material does not create a hazard.</p> <p>Verify that bags, containers, bundles, etc., stored in tiers are stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.</p> <p>Verify that storage areas are kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.</p> <p>Verify that vegetation control is exercised when necessary.</p> <p>Verify that clearance signs to warn of clearance limits are provided.</p> <p>Verify that derail and/or bumper blocks are provided on spur railroad tracks where a rolling car could contact other cars being worked on, or enter a building, work area or traffic area.</p> <p>Verify that covers and/or guardrails are provided to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.</p>



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<p><b>MS.20</b>  <b>SERVICING MULTI-PIECE AND SINGLE PIECE RIM WHEELS</b></p> <p><b>MS.20.1.</b> The installation must provide employee training which satisfies certain requirements (29 CFR 1910.177(c)).</p>	<p>(NOTE: 29 CFR 1910.177 (see the checklist items in MS.20) applies to the servicing of multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses, and off-road machines. It does not apply to the servicing of rim wheels use on automobiles, or on pickup trucks and vans utilizing automobile tires or truck tires designated "LT.")</p> <p>(NOTE: 29 CFR 1910.177 does not apply to installations and places of employment regulated under the <i>Construction Safety Standards</i>, 29 CFR part 1926; the <i>Agriculture Standards</i>, 29 CFR part 1928; the <i>Shipyards Standards</i>, 29 CFR part 1915; or the <i>Longshoring Standards</i>, 29 CFR part 1918.)</p> <p>(NOTE: All provisions of 29 CFR 1910.177 apply to the servicing of both single piece rim wheels and multi-piece rim wheels unless designated otherwise.)</p> <p>Verify that the installation provides a program to train all employees who service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.</p> <p>Verify that the installation ensures that no employee services any rim wheel unless the employee has been trained and instructed in correct procedures of servicing the type of wheel being serviced, and in the safe operating procedures described in 29 CFR 1910.177(f) and 1910.177(g) (see checklist items MS.20.8 through MS.20.11).</p> <p>Verify that information to be used in the training program includes, at a minimum:</p> <ul style="list-style-type: none"> <li>- the applicable data contained in the charts (rim manuals)</li> <li>- the contents of 29 CFR 1910.177 (see the checklist items in MS.20).</li> </ul> <p>Verify that, where an installation knows or has reason to believe that any of its employees is unable to read and understand the charts or rim manual, the installation ensures that the employee is instructed concerning the contents of the charts and rim manual in manner which the employee is able to understand.</p> <p>Verify that the installation ensures that each employee demonstrates and maintains the ability to service rim wheels safely, including performance of the following tasks:</p> <ul style="list-style-type: none"> <li>- demounting of tires (including deflations)</li> <li>- inspection and identification of the rim wheel components</li> <li>- mounting of tires (including inflation with a restraining device or other safeguard required by 29 CFR 1910.177 (see the checklist items in MS.20))</li> <li>- use of the restraining device or barrier, and other equipment required by 29 CFR 1910.177 (see the checklist items in MS.20)</li> </ul>

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<p><b>MS.20.2.</b> The installation must furnish a restraining device under certain conditions (29 CFR 1910.177(d)(1) and 1910.177(d)(2)).</p> <p><b>MS.20.3.</b> Restraining devices and barriers must comply with certain requirements (29 CFR 1910.177(d)(3)).</p>	<ul style="list-style-type: none"> <li>- handling of rim wheels</li> <li>- inflation of the tire when a single piece rim wheel is mounted on a vehicle</li> <li>- an understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim wheel following inflation and</li> <li>- installation and removal of rim wheels.</li> </ul> <p>Verify that the installation evaluates each employee's ability to perform these tasks and to service rim wheels safely.</p> <p>Verify that the installation provides additional training as necessary to ensure that each employee maintains his or her proficiency.</p> <p>Verify that the installation furnishes a restraining device for inflating tires on multi-piece wheels.</p> <p>Verify that the installation provides a restraining device or barrier for inflating tires on single piece wheels.</p> <p>(NOTE: This requirement does not apply if the rim wheel will be bolted onto a vehicle during inflation.)</p> <p>Verify that each restraining device or barrier has the capacity to withstand the maximum force that would be transferred to it during a rim wheel separation occurring at 150 percent of the maximum tire specification pressure for the type of rim wheel being serviced.</p> <p>Verify that restraining devices and barriers are capable of preventing the rim wheel components from being thrown outside or beyond the device or barrier for any rim wheel positioned within or behind the device.</p> <p>Verify that restraining devices and barriers are visually inspected prior to each day's use and after any separation of the rim wheel components or sudden release of contained air.</p> <p>Verify that any restraining device or barrier exhibiting damage such as the following defects is immediately removed from service:</p> <ul style="list-style-type: none"> <li>- cracks at welds</li> <li>- cracked or broken components</li> <li>- bent or sprung components caused by mishandling, abuse, tire explosion, or rim wheel separation</li> <li>- pitting of components due to corrosion or</li> <li>- other structural damage which would decrease its effectiveness.</li> </ul>

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<p><b>MS.20.4.</b> The installation must furnish and ensure that an air line assembly meeting certain requirements is used for inflating tires (29 CFR 1910.177(d)(4)).</p> <p><b>MS.20.5.</b> Current charts or rim manuals must be available in the service area (29 CFR 1910.177(d)(5)).</p> <p><b>MS.20.6.</b> The installation must furnish and ensure that only certain tools are used to service rim wheels (29 CFR 1910.177(d)(6)).</p> <p><b>MS.20.7.</b> Wheel components must satisfy certain acceptability requirements (29 CFR 1910.177(e)).</p>	<p>Verify that restraining devices or barriers removed from service are not returned to service until they are repaired and reinspected.</p> <p>Verify that restraining devices or barriers requiring structural repair such as component replacement or rewelding are not returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of this checklist item.</p> <p>Verify that the installation furnishes and ensures that an air line assembly consisting of the following components is used for inflating tires:</p> <ul style="list-style-type: none"> <li>- a clip-on chuck</li> <li>- an in-line valve with a pressure gauge or a presettable regulator and</li> <li>- a sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.</li> </ul> <p>Verify that current charts or rim manuals containing instructions for the type of wheels being serviced are available in the service area.</p> <p>Verify that the installation furnishes and ensures that only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels.</p> <p>Verify that multi-piece wheel components are not interchanged.</p> <p>(NOTE: This requirement does not apply if provided otherwise in the charts or in the applicable rim manual.)</p> <p>Verify that multi-piece wheel components and single piece wheels are inspected prior to assembly.</p> <p>Verify that any wheel or wheel component which is bent out of shape, pitted from corrosion, broken, or cracked:</p> <ul style="list-style-type: none"> <li>- is not used</li> <li>- is marked or tagged unserviceable</li> <li>- is removed from the service area.</li> </ul> <p>Verify that damaged or leaky valves are replaced.</p> <p>Verify that rim flanges, rim gutters, rings, bead seating surfaces, and the bead areas of tires are free of any dirt, surface rust, scale, or loose or flaked rubber</p>

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<p><b>MS.20.8.</b> The installation must establish a safe operating procedure for servicing multi-piece rim wheels and must ensure that employees are instructed in and follow that procedure. (29 CFR 1910.177(f)).</p> <p><b>MS.20.9.</b> The safe operating procedure for servicing multi-piece rim wheels must include at least certain elements (29 CFR 1910.177(f)(1) through 1910.177(f)(11)).</p>	<p>build-up prior to mounting and inflation.</p> <p>Verify that the size (bead diameter and tire/wheel widths) and type of both the tire and the wheel are checked for compatibility prior to assembly of the rim wheel.</p> <p>Verify that the installation establishes a safe operating procedure for servicing multi-piece rim wheels.</p> <p>Verify that the installation ensures that employees are instructed in and follow that procedure.</p> <p>Verify that the safe operating procedure for servicing multi-piece rim wheels includes at least the elements listed in this checklist item.</p> <p>Verify that tires are completely deflated before demounting by removal of the valve core.</p> <p>Verify that tires are completely deflated by removing the valve core before a rim wheel is removed from the axle in either of the following situations:</p> <ul style="list-style-type: none"> <li>- when the tire has been driven underinflated at 80 percent or less of its recommended pressure, or</li> <li>- when there is obvious or suspected damage to the tire or wheel components.</li> </ul> <p>Verify that rubber lubricant is applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire.</p> <p>(NOTE: This requirement does not apply if the tire or wheel manufacturer recommends against it.)</p> <p>(NOTE: If a tire on a vehicle is underinflated but has more than 80 percent of the recommended pressure, the tire may be inflated while the rim wheel is on the vehicle provided remote control inflation equipment is used, and no employees remain in the trajectory during inflation.)</p> <p>Verify that tires are inflated outside a restraining device only to a pressure sufficient to force the tire bead onto the rim ledge and create an airtight seal with the tire and bead.</p> <p>Verify that, whenever a rim wheel is in a restraining device, the employee does not rest or lean any part of his body or equipment on or against the restraining device.</p>

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<p><b>MS.20.10.</b> The installation must establish a safe operating procedure for servicing single piece rim wheels and ensure that employees are instructed in and follow that procedure. (29 CFR 1910.177(g)).</p> <p><b>MS.20.11.</b> The safe operating procedure for servicing single piece rim wheels must include at least certain elements (29 CFR 1910.177(g)(1) through 1910.177(g)(12)).</p>	<p>Verify that, after tire inflation, the tire and wheel components are inspected while still within the restraining device to make sure that they are properly seated and locked.</p> <p>Verify that, if further adjustment to the tire or wheel components is necessary, the tire is deflated by removal of the valve core before the adjustment is made.</p> <p>Verify that no attempt is made to correct the seating of side and lock rings by hammering, striking or forcing the components while the tire is pressurized.</p> <p>Verify that cracked, broken, bent, or otherwise damaged rim components are not reworked, welded, brazed, or otherwise heated.</p> <p>Verify that, whenever multi-piece rim wheels are being handled, employees stay out of the trajectory.</p> <p>(NOTE: This requirement does not apply if the installation can demonstrate that performance of the servicing makes the employees presence in the trajectory necessary.)</p> <p>Verify that no heat is applied to a multi-piece wheel or wheel component.</p> <p>Verify that the installation establishes a safe operating procedure for servicing single piece rim wheels.</p> <p>Verify that the installation ensures that employees are instructed in and follow that procedure.</p> <p>Verify that the safe operating procedure for servicing single piece rim wheels includes at least the following elements listed in this checklist item.</p> <p>Verify that tires are completely deflated by removal of the valve core before demounting.</p> <p>Verify that mounting and demounting of the tire is done only from the narrow ledge side of the wheel.</p> <p>Verify that care is taken to avoid damaging the tire beads while mounting tires on wheels.</p> <p>Verify that tires are mounted only on compatible wheels of matching bead diameter and width.</p>

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	<p>Verify that nonflammable rubber lubricant is applied to bead and wheel mating surfaces before assembly of the rim wheel.</p> <p>(NOTE: This requirement does not apply if the tire or wheel manufacturer recommends against the use of any rubber lubricant.)</p> <p>Verify that, if a tire changing machine is used, the tire is inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.</p> <p>Verify that, if a bead expander is used, it is removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).</p> <p>Verify that tires are inflated only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with the lug nuts fully tightened.</p> <p>Verify that tires are not inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.</p> <p>Verify that employees stay out of the trajectory when inflating a tire.</p> <p>Verify that tires are not inflated to more than the inflation pressure stamped in the sidewall.</p> <p>(NOTE: This requirement does not apply if a higher pressure is recommended by the manufacturer.)</p> <p>Verify that tires are not inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.</p> <p>Verify that no heat is applied to a single piece wheel.</p> <p>Verify that cracked, broken, bent, or otherwise damaged wheels are not re-worked, welded, brazed, or otherwise heated.</p>

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<p><b>MS.30 POWERED INDUSTRIAL TRUCKS</b></p> <p><b>MS.30.1.</b> Approved trucks must bear a label or some other identifying mark indicating approval by the testing laboratory (29 CFR 1910.178(a)(3)).</p> <p><b>MS.30.2.</b> Modifications and additions must satisfy certain requirements (29 CFR 1910.178(a)(4)).</p> <p><b>MS.30.3.</b> A truck which is equipped with certain front-end attachments must be marked (29 CFR 1910.178(a)(5)).</p> <p><b>MS.30.4.</b> The user must see that all nameplates and markings are in place and are maintained in a legible condition (29 CFR 1910.178(a)(6)).</p>	<p>(NOTE: 29 CFR 1910.178 (see the checklist items in MS.30) contains safety requirements relating to fire protection, design, maintenance, and use of fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines. 29 CFR 1910.178 does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, nor to farm vehicles, nor to vehicles intended primarily for earth moving or over-the-road hauling.)</p> <p>(NOTE: As used in 29 CFR 1910.178, the term <i>approved truck</i> or <i>approved industrial truck</i> means a truck that is listed or approved for fire safety purposes for the intended use by a nationally recognized testing laboratory, using nationally recognized testing standards. Refer to 29 CFR 1910.155(c)(3)(iv)(A) for the definition of <i>listed</i>, and to 29 CFR 1910.7 for the definition of <i>nationally recognized testing laboratory</i>.)</p> <p>(NOTE: For requirements regarding dockboards (bridge plates), see 29 CFR 1910.30(a).)</p> <p>Verify that approved trucks bear a label or some other identifying mark indicating approval by the testing laboratory.</p> <p>Verify that modifications and additions which affect capacity and safe operation are not performed by the customer or user without manufacturers prior written approval.</p> <p>Verify that capacity, operation, and maintenance instruction plates, tags, or decals are changed accordingly.</p> <p>Verify that, if the truck is equipped with front-end attachments other than factory installed attachments, the user requests that the truck be marked to identify the attachments and show the approximate weight of the truck and attachment combination at maximum elevation with load laterally centered.</p> <p>Verify that the user sees that all nameplates and markings are in place and are maintained in a legible condition.</p>

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<p><b>MS.30.5.</b> The atmosphere or location must be classified prior to consideration of the type industrial trucks to be used (29 CFR 1910.178(b)(12)).</p> <p><b>MS.30.6.</b> The type of industrial truck required must be as provided for such location (29 CFR 1910.178(b)(12) through 1910.178(d)).</p>	<p>Verify that the atmosphere or location has been classified as to whether it is hazardous or nonhazardous prior to the consideration of industrial trucks being used therein.</p> <p>Verify that the type of industrial truck required is as provided in this checklist item for such location.</p> <p>(NOTE: Industrial trucks specified under this checklist item are the minimum types required but industrial trucks having greater safeguards may be used if desired.)</p> <p>(NOTE: For specific areas of use, see Appendix 48-1 which tabulates the information contained in this checklist item. References are to the corresponding classification as used in subpart S of 29 CFR 1910.)</p> <p>Verify that powered-operated industrial trucks are not used in atmospheres containing hazardous concentration of:</p> <ul style="list-style-type: none"> <li>- acetylene</li> <li>- butadiene</li> <li>- ethylene oxide</li> <li>- hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas)</li> <li>- propylene oxide</li> <li>- acetaldehyde</li> <li>- cyclopropane</li> <li>- diethyl ether</li> <li>- ethylene</li> <li>- isoprene</li> <li>- unsymmetrical dimethyl hydrazine (UDMH).</li> </ul> <p>Verify that power-operated industrial trucks are not used</p> <ul style="list-style-type: none"> <li>- in atmospheres containing hazardous concentrations of metal dust, including aluminum, magnesium, and their commercial alloys, other metals of similarly hazardous characteristics, or</li> <li>- in atmospheres containing carbon black, coal, or coke dust.</li> </ul> <p>(NOTE: This requirement does not apply to approved power-operated industrial trucks designated as EX, which may be used in such atmospheres.)</p> <p>Verify that, in atmospheres where dust of magnesium, aluminum or aluminum bronze may be present, fuses, switches, motor controllers, and circuit breakers of</p>

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	<p>trucks have enclosures specifically approved for such locations.</p> <p>Verify that only approved power-operated industrial trucks designated as EX are used in atmospheres containing any of the following gases or vapors in quantities sufficient to produce explosive or ignitable mixtures and where such concentrations of these gases or vapors exist continuously, intermittently or periodically under normal operating conditions or may exist frequently because of repair, maintenance operations, leakage, breakdown or faulty operation of equipment.</p> <ul style="list-style-type: none"> <li>- acetone</li> <li>- acrylonitrile</li> <li>- alcohol</li> <li>- ammonia</li> <li>- benzene</li> <li>- benzol</li> <li>- butane</li> <li>- ethylene dichloride</li> <li>- gasoline</li> <li>- hexane</li> <li>- lacquer solvent vapors</li> <li>- naphtha</li> <li>- natural gas</li> <li>- propane</li> <li>- propylene</li> <li>- styrene</li> <li>- vinyl acetate</li> <li>- vinyl chloride</li> <li>- xylenes.</li> </ul> <p>(NOTE: Power-operated industrial trucks designated as DY, EE, or EX may be used:</p> <ul style="list-style-type: none"> <li>- in locations where volatile flammable liquids or flammable gases are handled, processed or used, but in which the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in the case of abnormal operation of equipment</li> <li>- in locations in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation but which might become hazardous through failure or abnormal operation of the ventilating equipment</li> <li>- in locations which are adjacent to Class I, Division 1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clear air and effective safeguards against ventilation failure are provided.)</li> </ul>

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	<p>(NOTE: In locations used for the storage of hazardous liquids in sealed containers or liquefied or compressed gases in containers, approved power-operated industrial trucks designated as DS, ES, GS, or LPS may be used. This classification includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition. The quantity of hazardous material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that should receive consideration in determining whether or not the DS or DY, ES, EE, GS, LPS designated truck possesses sufficient safeguards for the location. Piping without valves, checks, meters and similar devices would not ordinarily be deemed to introduce a hazardous condition even though used for hazardous liquids or gases. Locations used for the storage of hazardous liquids or of liquefied or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.)</p> <p>Verify that only approved power operated industrial trucks designated as EX are used in atmospheres in which combustible dust is or may be in suspension continuously, intermittently, or periodically under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures, or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced.</p> <p>(NOTE: The EX classification usually includes:</p> <ul style="list-style-type: none"> <li>- the working areas of: <ul style="list-style-type: none"> <li>- grain handling and storage plants</li> <li>- rooms containing grinders or pulverizers</li> <li>- cleaners</li> <li>- graders</li> <li>- scalpers</li> <li>- open conveyors or spouts</li> <li>- open bins or hoppers, mixers, or blenders</li> <li>- automatic or hopper scales</li> <li>- packing machinery</li> <li>- elevator heads and boots</li> <li>- stock distributors</li> <li>- dust and stock collectors (except all-metal collectors vented to the outside)</li> </ul> </li> <li>- all similar dust producing machinery and equipment in: <ul style="list-style-type: none"> <li>- grain processing plants</li> <li>- starch plants</li> <li>- sugar pulverizing plants</li> <li>- malting plants</li> <li>- hay grinding plants</li> <li>- other occupancies of similar nature</li> </ul> </li> <li>- coal pulverizing plants (except where the pulverizing equipment is essen-</li> </ul>

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	<p>tially dust tight)</p> <ul style="list-style-type: none"> <li>- all working areas where metal dusts and powders are produced, processed, handled, packed, or stored (except in tight containers)</li> <li>- other similar locations where combustible dust may, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitable mixtures.)</li> </ul> <p>Verify that only approved power-operated industrial trucks designated as DY, EE, or EX are used in atmospheres in which combustible dust will not normally be in suspension in the air or will not be likely to be thrown into suspension by the normal operation of equipment or apparatus in quantities sufficient to produce explosive or ignitable mixtures but where deposits or accumulations of such dust may be ignited by arcs or sparks originating in the truck.</p> <p>Verify that only approved power-operated industrial trucks designated as DY, EE, or EX are used in locations which are hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.</p> <p>Verify that only approved power-operated industrial trucks designated as DS, DY, ES, EE, EX, GS, or LPS are used in locations where easily ignitable fibers are stored or handled, including outside storage, but are not being processed or manufactured.</p> <p>(NOTE: Industrial trucks designated as E, which have been previously used in these locations may be continued in use.)</p> <p>(NOTE: On piers and wharves handling general cargo, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements for these types may be used.)</p> <p>Verify that, if storage warehouses and outside storage locations are hazardous, only the approved power-operated industrial truck specified for such locations in this checklist item are used.</p> <p>Verify that, if general industrial or commercial properties are hazardous, only approved power-operated industrial trucks specified for such locations in this checklist item are used.</p> <p>(NOTE: If storage warehouses, outside storage locations, general industrial or commercial properties are not classified as hazardous, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements of these types may be used.)</p> <p>(NOTE: Power operated industrial trucks that have been originally approved for the use of gasoline for fuel, when converted to the use of liquefied petroleum gas</p>

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<p><b>MS.30.7.</b> All High Lift Rider trucks must be fitted with overhead guards which manufactured in accordance with certain requirements (29 CFR 1910.178(e)(1)).</p> <p><b>MS.30.8.</b> Fork trucks must, under certain circumstances, be fitted with a vertical load backrest extension manufactured in accordance with certain requirements (29 CFR 1910.178(e)(2)).</p> <p><b>MS.30.9.</b> The changing and charging of storage batteries must satisfy certain requirements (29 CFR 1910.178(g)).</p>	<p>fuel in accordance with the following requirements may be used in those locations where G, GS or LP, and LPS designated trucks have been specified in this checklist item:</p> <ul style="list-style-type: none"> <li>- the complete conversion results in a truck which embodies the features specified for LP or LPS designated trucks, and</li> <li>- such conversion equipment is approved.)</li> </ul> <p>Verify that High Lift Rider trucks are fitted with an overhead guard.</p> <p>(NOTE: This requirement does not apply if operating conditions do not permit.)</p> <p>Verify that, if the type of load presents a hazard, the user equips fork trucks with a vertical load backrest extension.</p> <p>Verify that battery charging installations are located in areas designated for that purpose.</p> <p>Verify that facilities are provided for:</p> <ul style="list-style-type: none"> <li>- flushing and neutralizing spilled electrolyte</li> <li>- fire protection</li> <li>- protecting charging apparatus from damage by trucks</li> <li>- adequate ventilation for dispersal of fumes from gassing batteries.</li> </ul> <p>Verify that a conveyor, overhead hoist, or equivalent material handling equipment is provided for handling batteries.</p> <p>Verify that reinstalled batteries are properly positioned and secured in the truck.</p> <p>Verify that a carboy tilter or siphon is provide for handling electrolyte.</p> <p>Verify that, when charging batteries, acid is poured into water; water is not poured into acid.</p> <p>Verify that trucks are properly positioned and brake applied before attempting to change or charge batteries.</p> <p>Verify that care is taken to ensure that vent caps are functioning.</p>

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<p><b>MS.30.10.</b> Auxiliary directional lighting must be provided on the truck under certain circumstances (29 CFR 1910.178(h)).</p> <p><b>MS.30.11.</b> Concentration levels of carbon monoxide gas must not exceed certain levels (29 CFR 1910.178(i)).</p> <p><b>MS.30.12.</b> Methods to prevent movement of trucks and railroad cars must satisfy certain requirements (29 CFR 1910.178(k)).</p> <p><b>MS.30.13.</b> Only trained and authorized operators are permitted to operate powered industrial trucks (29 CFR 1910.178(l)).</p> <p><b>MS.30.14.</b> Truck operations must satisfy certain requirements (29 CFR 1910.178(m)).</p>	<p>Verify that the battery (or compartment) cover(s) are open to dissipate heat.</p> <p>Verify that smoking is prohibited in the charging area.</p> <p>Verify that precautions are taken to prevent open flames, sparks, or electric arcs in battery charging areas.</p> <p>Verify that tools and other metallic objects are kept away from the top of uncovered batteries.</p> <p>Verify that, where general lighting is less than 2 lumens/ft<sup>2</sup>, auxiliary directional lighting is provided on the truck.</p> <p>Verify that concentration levels of carbon monoxide gas created by powered industrial truck operations does not exceed the levels specified in 29 CFR 1910.1000 (see Chapter 24: Air Contaminants).</p> <p>Verify that the brakes of highway trucks are set and wheel chocks placed under the rear wheels to prevent the trucks from rolling while they are boarded with powered industrial trucks.</p> <p>Verify that wheel stops or other recognized positive protection is provided to prevent railroad cars from moving during loading or unloading operations.</p> <p>(NOTE: Fixed jacks may be necessary to support a semitrailer and prevent up-ending during the loading or unloading when the trailer is not coupled to a tractor.)</p> <p>Verify that positive protection is provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.</p> <p>Verify that only trained and authorized operators operate powered industrial trucks.</p> <p>Verify that methods are devised to train operators in the safe operation of powered industrial trucks.</p> <p>Verify that trucks are not driven up to anyone standing in front of a bench or other fixed object.</p> <p>Verify that no person is allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.</p>

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	<p>Verify that unauthorized personnel are not permitted to ride on powered industrial trucks.</p> <p>Verify that a safe place to ride is provided where riding of trucks is authorized.</p> <p>Verify that the installation prohibits arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.</p> <p>Verify that, when a powered industrial truck is left unattended:</p> <ul style="list-style-type: none"> <li>- load engaging means are fully lowered</li> <li>- controls are neutralized</li> <li>- power is shut off</li> <li>- brakes are set.</li> </ul> <p>Verify that wheels on an unattended powered industrial truck are blocked if the truck is parked on an incline.</p> <p>(NOTE: A powered industrial truck is unattended when the operator is 25 ft. or more away from the vehicle which remains in his view, or whenever the operator leaves the vehicle and it is not in his view.)</p> <p>Verify that, when the operator of an industrial truck is dismounted and within 25 ft. of the truck still in his view:</p> <ul style="list-style-type: none"> <li>- the load engaging means is fully lowered</li> <li>- controls are neutralized</li> <li>- the brakes are set to prevent movement.</li> </ul> <p>Verify that a safe distance is maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car.</p> <p>Verify that trucks are not used for opening or closing freight doors.</p> <p>Verify that brakes are set and wheel blocks are in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading.</p> <p>(NOTE: Fixed jacks may be necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor.)</p> <p>Verify that the flooring of trucks, trailers, and railroad cars is checked for breaks and weakness before they are driven onto.</p> <p>Verify that there is sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.</p>

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<p><b>MS.30.15.</b> Traveling must satisfy certain requirements (29 CFR 1910.178(n)).</p>	<p>Verify that an overhead guard is used as protection against falling objects.</p> <p>(NOTE: An overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.)</p> <p>Verify that a load backrest extension is used whenever necessary to minimize the possibility of the load or part of it from falling rearward.</p> <p>Verify that only approved industrial trucks are used in hazardous locations.</p> <p>Verify that, whenever a truck is equipped with vertical only, or vertical and horizontally controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions are taken for the protection of personnel being elevated:</p> <ul style="list-style-type: none"> <li>- a safety platform firmly secured to the lifting carriage and/or forks is used</li> <li>- means is provided whereby personnel on the platform can shut off power to the truck</li> <li>- such protection from falling objects as indicated necessary by the operating conditions is provided.</li> </ul> <p>Verify that fire aisles, access to stairways, and fire equipment is kept clear.</p> <p>Verify that all traffic regulations are observed, including authorized plant speed limits.</p> <p>Verify that a safe distance is maintained approximately three truck lengths from the truck ahead, and the truck is kept under control at all times.</p> <p>Verify that the right of way is yielded to ambulances, fire trucks, or other vehicles in emergency situations.</p> <p>Verify that other trucks traveling in the same direction at intersections, blind spots, or other dangerous locations are not passed.</p> <p>Verify that the driver is required to slow down and sound the horn at cross aisles and other locations where vision is obstructed.</p> <p>Verify that, if the load being carried obstructs forward view, the driver travels with the load trailing.</p> <p>Verify that railroad tracks are crossed diagonally wherever possible.</p> <p>Verify that the driver does not park closer than 8 ft from the center of railroad tracks.</p>

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<p><b>MS.30.16.</b> Loading must satisfy certain requirements (29 CFR 1910.178(o)).</p>	<p>Verify that the driver looks in the direction of, and keep a clear view or the path of travel.</p> <p>Verify that grades are ascended or descended slowly.</p> <p>Verify that, when ascending or descending grades in excess of 10 percent, loaded trucks are driven with the load upgrade.</p> <p>Verify that, on all grades, the load and load engaging means is tilted back if applicable, and raised only as far as necessary to clear the road surface.</p> <p>Verify that under all travel conditions the truck is operated at a speed that will permit it to be brought to a stop in a safe manner.</p> <p>Verify that stunt driving and horseplay are not permitted.</p> <p>Verify that the driver slows down for wet and slippery floors.</p> <p>Verify that dockboard or bridgeplates are properly secured before they are driven over.</p> <p>Verify that dockboard or bridgeplates are driven over carefully and slowly and that their rated capacity never exceeded.</p> <p>Verify that elevators are approached slowly, and then entered squarely after the elevator car is properly leveled.</p> <p>Verify that, once on the elevator, the controls are neutralized, power shut off, and the brakes set.</p> <p>Verify that motorized hand trucks enter elevator or other confined areas with load end forward.</p> <p>Verify that running over loose objects on the roadway surface is avoided.</p> <p>Verify that, while negotiating turns, speed is reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion.</p> <p>Verify that the hand steering wheel is turned at a moderate, even rate.</p> <p>(NOTE: This requirement does not apply when maneuvering at a very low speed.)</p> <p>Verify that only stable or safely arranged loads are handled.</p> <p>Verify that caution is exercised when handling off-center loads which cannot be centered.</p>

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<p><b>MS.30.17.</b> Operation of the truck must satisfy certain requirements (29 CFR 1910.178(p)).</p>	<p>Verify that only loads within the rated capacity of the truck are handled.</p> <p>Verify that the long or high (including multiple-tiered) loads which may affect capacity are adjusted.</p> <p>Verify that trucks equipped with attachments are operated as partially loaded trucks when not handling a load.</p> <p>Verify that a load engaging means is placed under the load as far as possible.</p> <p>Verify that the mast is carefully tilted backward to stabilize the load.</p> <p>Verify that extreme care is used when tilting the load forward or backward, particularly when high tiering.</p> <p>Verify that tilting forward with load engaging means elevated is prohibited.</p> <p>(NOTE: This requirement does not apply to picking up a load.)</p> <p>Verify that an elevated load is not tilted forward.</p> <p>(NOTE: This requirement does not apply when the load is in a deposit position over a rack or stack.)</p> <p>Verify that, when stacking or tiering, only enough backward tilt to stabilize the load is used.</p> <p>Verify that, if at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck is taken out of service until it has been restored to safe operating condition.</p> <p>Verify that fuel tanks are not filled while the engine is running.</p> <p>Verify that spillage of fuel or oil is avoided.</p> <p>Verify that spillage of oil or fuel is carefully washed away or completely evaporated and that the fuel tank cap replaced before restarting the engine.</p> <p>Verify that no truck is operated with a leak in the fuel system until the leak has been corrected.</p> <p>Verify that open flames are not used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.</p>

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<p><b>MS.30.18.</b> Maintenance of industrial trucks must satisfy certain requirements (29 CFR 1910.178(q)).</p>	<p>Verify that any power-operated industrial truck not in safe operating condition is removed from service.</p> <p>Verify that all repairs are made by authorized personnel.</p> <p>Verify that no repairs are made in Class I, II, and III locations.</p> <p>Verify that those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards are conducted only in locations designated for such repairs.</p> <p>Verify that trucks in need of repairs to the electrical system have the battery disconnected prior to such repairs.</p> <p>Verify that all parts of any such industrial truck requiring replacement is replaced only by parts equivalent as to safety with those used in the original design.</p> <p>Verify that industrial trucks are not altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer.</p> <p>Verify that industrial trucks are not altered by the addition of extra parts not provided by the manufacturer or by the elimination of any parts.</p> <p>(NOTE: This requirement does not apply if provided otherwise in the approved conversion of an industrial truck from gasoline fuel to liquefied petroleum gas fuel.)</p> <p>Verify that additional counterweighting of fork trucks is not done unless approved by the truck manufacturer.</p> <p>Verify that industrial trucks are examined before being placed in service, and are not placed in service if the examination shows any condition adversely affecting the safety of the vehicle.</p> <p>Verify that such examination is made at least daily.</p> <p>Verify that, where industrial trucks are used on a round-the-clock basis, they are examined after each shift.</p> <p>Verify that defects, when found, are immediately reported and corrected.</p> <p>Verify that water mufflers are filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity.</p>

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	<p>Verify that vehicles with mufflers having screens or other parts that may become clogged are not operated while such screens or parts are clogged.</p> <p>Verify that any vehicle that emits hazardous sparks or flames from the exhaust system is immediately removed from service, and not returned to service until the cause for the emission of such sparks and flames has been eliminated.</p> <p>Verify that, when the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle is removed from service and not returned to service until the cause for such overheating has been eliminated.</p> <p>Verify that industrial trucks are kept in a clean condition, free of lint, excess oil, and grease.</p> <p>(NOTE: Noncombustible agents should be used for cleaning trucks.)</p> <p>Verify that low flash point (below 100 °F.) solvents are not used.</p> <p>(NOTE: High flash point (at or above 100 °F.) solvents may be used.)</p> <p>Verify that precautions regarding toxicity, ventilation, and fire hazard are consonant with the agent or solvent used.</p> <p>(NOTE: Industrial trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas fuel provided the complete conversion results in a truck which embodies the features specified for LP or LPS designated trucks. The description of the component parts of this conversion system and the recommended method of installation on specific trucks are contained in the <i>Listed by Report.</i>)</p> <p>Verify that such conversion equipment is approved.</p>



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<p><b>MS.40</b>  <b>OVERHEAD AND GANTRY CRANES</b></p> <p><b>MS.40.1.</b> Modified cranes must satisfy certain requirements (29 CFR 1910.179(b)(3)).</p> <p><b>MS.40.2.</b> Wind indicators and rail clamps that meet specific standards must be provided under certain circumstances (29 CFR 1910.179(b)(4)).</p> <p><b>MS.40.3.</b> Rated load markings must satisfy certain requirements (29 CFR 1910.179(b)(5)).</p> <p><b>MS.40.4.</b> Certain clearances must be provided and maintained between crane and obstructions (29 CFR 1910.179(b)(6)).</p>	<p>(NOTE: 29 CFR 1910.179 (see the checklist items in MS.40) applies to overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics. These cranes are grouped because they all have trolleys and similar travel characteristics.)</p> <p>(NOTE: Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer.)</p> <p>Verify that, on the modified crane, test loads are not more than 125 percent of the rated load unless otherwise recommended by the manufacturer.</p> <p>Verify that the test reports are placed on file where readily available to appointed personnel.</p> <p>Verify that the new rated load of the crane is plainly marked each side of the crane.</p> <p>Verify that, if the crane has more than one hoisting unit, each hoist has its new rated load marked on it or its load block.</p> <p>Verify that this marking is clearly legible from the ground or floor.</p> <p>Verify that outdoor storage bridges are provided with automatic rail clamps.</p> <p>Verify that a wind-indicating device is provided which will give a visible or audible alarm to the bridge operator at a predetermined wind velocity.</p> <p>Verify that, if the clamps act on the rail heads, any beads or weld flash on the rail heads is ground off.</p> <p>Verify that the rated load of the crane is plainly marked each side of the crane.</p> <p>Verify that, if the crane has more than one hoisting unit, each hoist has its rated load marked on it or its load block.</p> <p>Verify that this marking is clearly legible from the ground or floor.</p> <p>Verify that a minimum clearance of 3 in. overhead and 2 in. laterally is provided and maintained between crane and obstructions.</p> <p>Verify that, where passageways or walkways are provided, no obstructions are placed such that the safety of personnel will be jeopardized by movements of the crane.</p>

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<b>MS.40.5.</b> A certain clearance between parallel cranes must be maintained (29 CFR 1910.179(b)(7)).	Verify that, if the runways of two cranes are parallel, and there are no intervening walls or structure, there is adequate clearance provided and maintained between the two bridges.
<b>MS.40.6.</b> Installations must permit only designated personnel to operate certain cranes (29 CFR 1910.179(b)(8)).	Verify that designated personnel only are permitted to operate a crane covered by 29 CFR 1910.179 (see the checklist items in MS.40).
<b>MS.40.7.</b> Cab location must satisfy certain requirements (29 CFR 1910.179(c)(1)).	<p>Verify that the general arrangement of the cab and the location of control and protective equipment is such that all operating handles are within convenient reach of the operator when facing the area to be served by the load hook, or while facing the direction of travel of the cab.</p> <p>Verify that the arrangement allows the operator a full view of the load hook in all positions.</p> <p>Verify that the cab is located to afford a minimum of 3-in. clearance from all fixed structures within its area of possible movement.</p>
<b>MS.40.8.</b> Access to the crane must satisfy certain requirements (29 CFR 1910.179(c)(2)).	Verify that access to the cab and/or bridge walkway is by a conveniently placed fixed ladder, stairs, or platform requiring no step over any gap exceeding 12 in.
<b>MS.40.9.</b> Carbon tetrachloride extinguishers must not be used. (29 CFR 1910.179(c)(3)).	Verify that carbon tetrachloride extinguishers are not used.
<b>MS.40.10.</b> Light in the cab must be sufficient to enable the operator to see clearly enough to perform his work. (29 CFR 1910.179(c)(4)).	Verify that light in the cab is sufficient to enable the operator to see clearly enough to perform his work.
<b>MS.40.11.</b> Footwalks must satisfy certain requirements (29 CFR 1910.179(d)(1) and 1910.179(d)(2)).	<p>Verify that, if sufficient headroom is available on cab-operated cranes, a footwalk is provided on the drive side along the entire length of the bridge of all cranes having the trolley running on the top of the girders.</p> <p>Verify that, where footwalks are located, in no case is less than 48 in. of headroom provided.</p> <p>Verify that footwalks are of rigid construction and designed to sustain a distrib-</p>

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<p><b>MS.40.12.</b> Toeboards and handrails must be in compliance with certain requirements (29 CFR 1910.179(d)(3)).</p> <p><b>MS.40.13.</b> Ladders and stairways must satisfy certain requirements (29 CFR 1910.179(d)(4)).</p> <p><b>MS.40.14.</b> Trolley stops must satisfy certain requirements (29 CFR 1910.179(e)(1)).</p> <p><b>MS.40.15.</b> Bridge bumpers must satisfy certain requirements (29 CFR 1910.179(e)(2)).</p>	<p>uted load of at least 50 lb/ft<sup>2</sup>.</p> <p>Verify that footwalks have a walking surface of antislip type.</p> <p>(NOTE: Wood will meet this requirement.)</p> <p>Verify that the inner edge extends at least to the line of the outside edge of the lower cover plate or flange of the girder.</p> <p>Verify that toeboards and handrails are in compliance with 29 CFR 1910.23 (see the checklist items in WS.20).</p> <p>Verify that gantry cranes are provided with ladders or stairways extending from the ground to the footwalk or cab platform.</p> <p>Verify that stairways are equipped with rigid and substantial metal handrails.</p> <p>Verify that walking surfaces are of an antislip type.</p> <p>Verify that ladders are permanently and securely fastened in place and are constructed in compliance with 29 CFR 1910.27 (see the checklist items in WS.60).</p> <p>Verify that stops are provided at the limits of travel of the trolley.</p> <p>Verify that stops are fastened to resist forces applied when contacted.</p> <p>Verify that a stop engaging the tread of the wheel is of a height at least equal to the radius of the wheel.</p> <p>Verify that the crane is provided with bumpers or other automatic means providing equivalent effect.</p> <p>(NOTE: This requirement does not apply if:</p> <ul style="list-style-type: none"> <li>- the crane travels at a slow rate of speed and has a faster deceleration rate due to the use of sleeve bearings</li> <li>- is not operated near the ends of bridge and trolley travel</li> <li>- is restricted to a limited distance by the nature of the crane operation and there is no hazard of striking any object in this limited distance, or</li> <li>- is used in similar operating conditions.)</li> </ul> <p>Verify that the crane bumpers are capable of stopping the crane (not including the lifted load) at an average rate of deceleration not to exceed 3 ft/s/s when traveling in either direction at 20 percent of the rated load speed.</p>

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<p><b>MS.40.16.</b> Trolley bumpers must satisfy certain requirements (29 CFR 1910.179(e)(3)).</p> <p><b>MS.40.17.</b> Bridge trucks must be equipped with rail sweeps which extend below the top of the rail and project in front of the truck wheels (29 CFR 1910.179(e)(4)).</p> <p><b>MS.40.18.</b> Guards for hoisting ropes must satisfy certain requirements (29 CFR 1910.179(e)(5)).</p> <p><b>MS.40.19.</b> Guards for moving parts must satisfy certain requirements (29 CFR 1910.179(e)(6)).</p>	<p>Verify that bumpers have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40 percent of rated load speed.</p> <p>Verify that the bumper is mounted in such a way that there is no direct shear on bolts.</p> <p>Verify that bumpers are so designed and installed as to minimize parts falling from the crane in case of breakage.</p> <p>Verify that the trolley is provided with bumpers or other automatic means of equivalent effect.</p> <p>(NOTE: This requirement does not apply if:</p> <ul style="list-style-type: none"> <li>- the trolley travels at a slow rate of speed</li> <li>- is not operated near the ends of bridge and trolley travel</li> <li>- is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance, or</li> <li>- is used in similar operating conditions.)</li> </ul> <p>Verify that the bumpers are capable of stopping the trolley (not including the lifted load) at an average rate of deceleration not to exceed 4.7 ft/s/s when traveling in either direction at one-third of the rated load speed.</p> <p>Verify that, when more than one trolley is operated on the same bridge, each is equipped with bumpers or equivalent on their adjacent ends.</p> <p>Verify that bumpers or equivalent are designed and installed to minimize parts falling from the trolley in case of breakage.</p> <p>Verify that bridge trucks are equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.</p> <p>Verify that, if hoisting ropes run near enough to other parts to make fouling or chafing possible, guards are installed to prevent this condition.</p> <p>Verify that a guard is provided to prevent contact between bridge conductors and hoisting ropes if they could come into contact.</p> <p>Verify that exposed moving parts (such as gears, set screws, projecting keys, chains, chain sprockets, and reciprocating components) which might constitute a hazard under normal operating conditions are guarded.</p>

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<p><b>MS.40.20.</b> Brakes for hoists must satisfy certain requirements (29 CFR 1910.179(f)(1)).</p>	<p>Verify that guards are securely fastened.</p> <p>Verify that each guard is capable of supporting without permanent distortion the weight of a 200 lb person.</p> <p>(NOTE: This requirement does not apply where it is impossible for a person to step on the guard.)</p> <p>Verify that each independent hoisting unit of a crane is equipped with at least one self-setting brake applied directly to the motor shaft or some part of the gear train.</p> <p>(NOTE: A self-setting brake is hereafter referred to as a holding brake.)</p> <p>Verify that each independent hoisting unit of a crane is equipped with control braking means to prevent overspeeding, in addition to a holding brake.</p> <p>(NOTE: This requirement does not apply to worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction.)</p> <p><b>MS.40.21.</b> Holding brakes must satisfy certain requirements (29 CFR 1910.179(f)(2)).</p> <p>Verify that holding brakes for hoist motors have not less than the following percentage of the full load hoisting torque at the point where the brake is applied:</p> <ul style="list-style-type: none"> <li>- 125 percent when used with a control braking means other than mechanical</li> <li>- 100 percent when used in conjunction with a mechanical control braking means</li> <li>- 100 percent each if two holding brakes are provided.</li> </ul> <p>Verify that holding brakes on hoists have ample thermal capacity for the frequency of operation required by the service.</p> <p>Verify that holding brakes on hoists are applied automatically when power is removed.</p> <p>Verify that, where necessary, holding brakes are provided with adjustment means to compensate for wear.</p> <p>Verify that the wearing surface of all holding-brake drums or discs is smooth.</p> <p>Verify that each independent hoisting unit of a crane handling hot metal and having power control braking means is equipped with at least two holding brakes.</p> <p><b>MS.40.22.</b> Control braking means must satisfy certain requirements (29 CFR</p>

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<p>1910.179(f)(3)).</p> <p><b>MS.40.23.</b> Brakes for trolleys and bridges must satisfy certain requirements (29 CFR 1910.179(f)(4)).</p> <p><b>MS.40.24.</b> Cab-operated cranes with cab on trolley must have a trolley brake which satisfies certain requirements (29 CFR 1910.179(f)(5)).</p>	<p>maintaining safe lowering speeds of rated loads.</p> <p>Verify that the control braking means has ample thermal capacity for the frequency of operation required by service.</p> <p>Verify that foot-operated brakes do not require an applied force of more than 70 lb to develop manufacturer's rated brake torque.</p> <p>(NOTE: Brakes may be applied by mechanical, electrical, pneumatic, hydraulic, or gravity means.)</p> <p>Verify that, when necessary, brakes are provided with adjustment means to compensate for wear.</p> <p>Verify that the wearing surface of all brake drums or discs is smooth.</p> <p>Verify that all foot-brake pedals are constructed so that the operator's foot will not easily slip off the pedal.</p> <p>Verify that foot-operated brakes are equipped with automatic means for positive release when pressure is released from the pedal.</p> <p>Verify that brakes for stopping the motion of the trolley or bridge are of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load.</p> <p>Verify that, if holding brakes are provided on the bridge or trolleys, they do not prohibit the use of a drift point in the control circuit.</p> <p>Verify that brakes on trolleys and bridges have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions from overheating.</p> <p>Verify that a trolley brake is provided on cab-operated cranes with cab on trolley.</p> <p>Verify that foot-operated brakes do not require an applied force of more than 70 lb to develop manufacturer's rated brake torque.</p> <p>(NOTE: Brakes may be applied by mechanical, electrical, pneumatic, hydraulic, or gravity means.)</p> <p>Verify that, when necessary, brakes are provided with adjustment means to compensate for wear.</p> <p>Verify that the wearing surface of all brake drums or discs is smooth.</p> <p>Verify that all foot-brake pedals are constructed so that the operator's foot will</p>

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<p><b>MS.40.25.</b> The application of bridge brakes must satisfy certain requirements (29 CFR 1910.179(f)(6)(i)).</p>	<p>not easily slip off the pedal.</p> <p>Verify that foot-operated brakes are equipped with automatic means for positive release when pressure is released from the pedal.</p> <p>Verify that brakes for stopping the motion of the trolley or bridge are of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load.</p> <p>Verify that, if holding brakes are provided on the bridge or trolleys, they do not prohibit the use of a drift point in the control circuit.</p> <p>Verify that brakes on trolleys and bridges have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions from overheating.</p> <p>(NOTE: A drag brake may be applied to hold the trolley in a desired position on the bridge and to eliminate creep with the power off.)</p> <p>Verify that a bridge brake is provided on cab-operated cranes with cab on bridge.</p> <p>Verify that foot-operated brakes do not require an applied force of more than 70 lb to develop manufacturer's rated brake torque.</p> <p>(NOTE: Brakes may be applied by mechanical, electrical, pneumatic, hydraulic, or gravity means.)</p> <p>Verify that, when necessary, brakes are provided with adjustment means to compensate for wear.</p> <p>Verify that the wearing surface of all brake drums or discs is smooth.</p> <p>Verify that all foot-brake pedals are constructed so that the operator's foot will not easily slip off the pedal.</p> <p>Verify that foot-operated brakes are equipped with automatic means for positive release when pressure is released from the pedal.</p> <p>Verify that brakes for stopping the motion of the trolley or bridge are of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load.</p> <p>Verify that, if holding brakes are provided on the bridge or trolleys, they do not prohibit the use of a drift point in the control circuit.</p> <p>Verify that brakes on trolleys and bridges have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions</p>

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<p><b>MS.40.26.</b> Cab-operated cranes with cab on trolley must have a bridge brake of the holding type (29 CFR 1910.179(f) (6)(ii)).</p> <p><b>MS.40.27.</b> Floor, remote and pulpit-operated crane bridge drives must have a brake of noncoasting mechanical drive (29 CFR 1910.179(f)(6)(iii)).</p> <p><b>MS.40.28.</b> Electrical equipment must satisfy certain general requirements (29 CFR 1910.179(g)(1)).</p> <p><b>MS.40.29.</b> Electrical equipment must satisfy certain specific requirements (29 CFR 1910.179(g)(2)).</p> <p><b>MS.40.30.</b> Controllers must satisfy certain requirements (29 CFR 1910.179(g)(3)).</p>	<p>from overheating.</p> <p>Verify that a bridge brake of the holding type is provided on cab-operated cranes with cab on trolley.</p> <p>Verify that a brake of noncoasting mechanical drive is provided on all floor, remote and pulpit-operated crane bridge drives.</p> <p>Verify that wiring and equipment complies with subpart S of 29 CFR 1910.</p> <p>Verify that the control circuit voltage does not exceed 600 volts for a.c. or d.c. current.</p> <p>Verify that the voltage at pendant push-buttons is does not exceed 150 volts for a.c. and 300 volts for d.c.</p> <p>Verify that, where multiple conductor cable is used with a suspended pushbutton station, the station is supported in some satisfactory manner that will protect the electrical conductors against strain.</p> <p>Verify that pendant control boxes are constructed to prevent electrical shock.</p> <p>Verify that pendant control boxes are clearly marked for identification of functions.</p> <p>Verify that electrical equipment is so located or enclosed that live parts will not be exposed to accidental contact under normal operating conditions.</p> <p>Verify that electric equipment is protected from dirt, grease, oil, and moisture.</p> <p>Verify that guards for live parts are substantial and so located that they cannot be accidently deformed so as to make contact with the live parts.</p> <p>Verify that cranes not equipped with spring-return controllers or momentary contact pushbuttons are provided with a device which will disconnect all motors from the line on failure of power and will not permit any motor to be restarted until the controller handle is brought to the OFF position, or a reset switch or button is operated.</p> <p>Verify that lever operated controllers are provided with a notch or latch which in</p>

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<p align="center"><b>REGULATORY REQUIREMENTS:</b></p>	<p align="center"><b>REVIEWER CHECKS:</b>  <b>September 1997</b></p>
<p><b>MS.40.31.</b> Resistors must satisfy certain requirements (29 CFR 1910.179(g)(4)).</p>	<p>the OFF position prevents the handle from being inadvertently moved to the ON position.</p> <p>(NOTE: An OFF detent or spring-return arrangement is acceptable.)</p> <p>Verify that the controller operating handle is located within convenient reach of the operator.</p> <p>Verify that, as far as practicable, the movements of each controller handle are in the same general directions as the resultant movements of the load.</p> <p>Verify that the control for the bridge and trolley travel is so located that the operator can readily face the direction of travel.</p> <p>Verify that, for floor-operated cranes, the controller or controllers (if rope operated) automatically returns to the OFF position when released by the operator.</p> <p>Verify that pushbuttons in pendant stations return to the OFF position when pressure is released by the crane operator.</p> <p>Verify that automatic cranes are so designed that all motions failsafe if any malfunction of operation occurs.</p> <p>Verify that remote-operated cranes function so that if the control signal for any crane motion becomes ineffective, the crane motion stops.</p> <p>Verify that enclosures for resistors have openings to provide adequate ventilation.</p> <p>Verify that enclosures for resistors are installed to prevent the accumulation of combustible matter too near to hot parts.</p> <p>Verify that resistor units are supported so as to be as free as possible from vibration.</p> <p>Verify that provision is made to prevent broken parts or molten metal falling upon the operator or from the crane.</p>
<p><b>MS.40.32.</b> Switches must satisfy certain requirements (29 CFR 1910.179(g)(5)).</p>	<p>Verify that the power supply to the runway conductors is controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position.</p> <p>Verify that, on cab-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, is provided in the leads from the runway conductors.</p> <p>Verify that a means of opening this switch or circuit breaker is located within easy reach of the operator.</p>

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<p><b>MS.40.33.</b> Runway conductors must satisfy certain requirements (29 CFR 1910.179(g)(6)).</p> <p><b>MS.40.34.</b> Service receptacles must satisfy certain requirements (29 CFR 1910.179(g)(7)).</p> <p><b>MS.40.35.</b> Sheaves must satisfy certain requirements (29 CFR 1910.179(h)(1)).</p>	<p>Verify that, on floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, is provided in the leads from the runway conductors.</p> <p>Verify that this disconnect is mounted on the bridge or footwalk near the runway collectors.</p> <p>Verify that, on floor-operated cranes, one of the following types of floor-operated disconnects is provided:</p> <ul style="list-style-type: none"> <li>- nonconductive rope attached to the main disconnect switch</li> <li>- an undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton station</li> <li>- a main line contactor operated by a switch or pushbutton in the pendant push-button station.</li> </ul> <p>Verify that the hoisting motion of all electric traveling cranes is provided with an overtravel limit switch in the hoisting direction.</p> <p>Verify that all cranes using a lifting magnet have a magnet circuit switch of the enclosed type with provision for locking in the open position.</p> <p>Verify that means for discharging the inductive load of the magnet is provided.</p> <p>Determine if conductors of the open type are mounted on the crane runway beams or overhead.</p> <p>Verify that such conductors are located or guarded so that persons entering or leaving the cab or crane footwalk normally could not come into contact with them.</p> <p>Verify that, if a service receptacle is provided in the cab or on the bridge of cab-operated cranes, it is a grounded three-prong type permanent receptacle, not exceeding 300 volts.</p> <p>Verify that sheave grooves are smooth and free from surface defects which could cause rope damage.</p> <p>Verify that sheaves carrying ropes which can be momentarily unloaded are provided with close-fitting guards or other suitable devices to guide the rope back into the groove when the load is applied again.</p> <p>Verify that the sheaves in the bottom block are equipped with close-fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with ropes loose.</p>

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<p><b>MS.40.36.</b> Ropes must satisfy certain requirements (29 CFR 1910.179(h)(2)).</p>	<p>Verify that pockets and flanges of sheaves used with hoist chains are of such dimensions that the chain does not catch or bind during operation.</p> <p>Verify that all running sheaves are equipped with means for lubrication.</p> <p>(Note: This requirement does not apply to permanently lubricated, sealed and/or shielded bearings.)</p> <p>Verify that, in using hoisting ropes, the crane manufacturer's recommendations are followed.</p> <p>Verify that the rated load divided by the number of parts of rope does not exceed 20 percent of the nominal breaking strength of the rope.</p> <p>Verify that socketing is done in the manner specified by the manufacturer of the assembly.</p> <p>Verify that rope is secured to the drum as follows:</p> <ul style="list-style-type: none"> <li>- no less than two wraps of rope remain on the drum when the hook is in its extreme low position</li> <li>- rope end is anchored by a clamp securely attached to the drum or by a socket arrangement approved by the crane or rope manufacturer.</li> </ul> <p>Verify that rope clips attached with U-bolts have the U-bolts on the dead or short end to the rope.</p> <p>Verify that spacing and number of all types of clips are in accordance with the clip manufacturer's recommendation.</p> <p>Verify that clips are drop-forged steel in all sizes manufactured commercially.</p> <p>Verify that, when a newly installed rope has been in operation for an hour, all nuts on the clip bolts are retightened.</p> <p>Verify that swaged or compressed fittings are applied as recommended by the rope or crane manufacturer.</p> <p>Verify that, wherever exposed to temperatures at which fiber cores would be damaged, rope having an independent wire rope or wire-strand core, or other temperature-damage resistant core is used.</p> <p>Verify that replacement rope is the same size, grade, and construction as the original rope furnished by the crane manufacturer.</p> <p>(NOTE: This requirement does not apply if otherwise recommended by a wire rope manufacturer due to actual working condition requirements.)</p>

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<b>MS.40.37.</b> The tension in wire rope parts must be equalized if the load is supported by more than one part of rope (29 CFR 1910.179(h)(3)).	Verify that, if a load is supported by more than one part of rope, the tension in the parts is equalized.
<b>MS.40.38.</b> Hooks must meet manufacturer's recommendations and must not be overloaded (29 CFR 1910.179(h)(4)).	Verify that hooks meet the manufacturer's recommendations.  Verify that hooks are not overloaded.
<b>MS.40.39.</b> A warning device must be provided for each crane equipped with a power traveling mechanism (29 CFR 1910.179(i)).	Verify that a gong or other effective warning signal is provided for each crane equipped with a power traveling mechanism.  (NOTE: This requirement does not apply to floor-operated cranes.)
<b>MS.40.40.</b> Initial inspections must be performed on all new and altered cranes (29 CFR 1910.179(j)(1)).	Verify that, prior to initial use, all new and altered cranes are inspected to ensure compliance with the provisions of 29 CFR 1910.179 (see checklist items MS.40).  (NOTE: Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic" with respective intervals between inspections as defined below: <ul style="list-style-type: none"> <li>- frequent inspection - daily to monthly intervals</li> <li>- periodic inspection - 1- to 12-mo intervals.)</li> </ul>
<b>MS.40.41.</b> Frequent inspections which satisfy certain requirements must be performed (29 CFR 1910.179(j)(2)).	Verify that the following items are inspected for defects at daily to monthly intervals or as specifically indicated:  <ul style="list-style-type: none"> <li>- all functional operating mechanisms for maladjustment interfering with proper operation. (Daily).</li> <li>- deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. (Daily).</li> <li>- hooks with deformation or cracks. (Visual inspection daily; monthly inspection with a certification record which includes: <ul style="list-style-type: none"> <li>- the date of inspection,</li> <li>- the signature of the person who performed the inspection</li> <li>- the serial number, or other identifier, of the hook inspected)</li> </ul> </li> <li>- hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. (Visual inspection daily; monthly inspection with a cer-</li> </ul>

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<p><b>MS.40.42.</b> Periodic inspections which satisfy certain requirements must be performed (29 CFR 1910.179(j)(3)).</p>	<p>tification record which includes:</p> <ul style="list-style-type: none"> <li>- the date of inspection,</li> <li>- the signature of the person who performed the inspection</li> <li>- an identifier of the chain which was inspected)</li> <li>- all functional operating mechanisms for excessive wear of components.</li> <li>- rope reeving for noncompliance with manufacturer's recommendations.</li> </ul> <p>(NOTE: Hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 degree twist from the plane of the unbent hook are to be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted, they are only to be done under competent supervision and the hook is to be tested according to the following requirements before further use:</p> <ul style="list-style-type: none"> <li>- test loads must not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer</li> <li>- the test reports must be placed on file where readily available to appointed personnel.)</li> </ul> <p>Verify that the above items are also observed during operation for any defects which might appear between regular inspections.</p> <p>Verify that all deficiencies such as those listed above are carefully examined and determination made as to whether they constitute a safety hazard.</p> <p>Verify that complete inspections of the crane are performed at 1- to 12-mo intervals, depending upon its activity, severity of service, and environment, or as specifically indicated below.</p> <p>Verify that the inspections include the requirements of 29 CFR 1910.179(j)(2) (see checklist item MS.40.41) and in addition, the following items:</p> <ul style="list-style-type: none"> <li>- deformed, cracked, or corroded members</li> <li>- loose bolts or rivets</li> <li>- cracked or worn sheaves and drums</li> <li>- worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices</li> <li>- excessive wear on brake system parts, linings, pawls, and ratchets</li> <li>- load, wind, and other indicators over their full range, for any significant inaccuracies</li> <li>- gasoline, diesel, electric, or other powerplants for improper performance or noncompliance with applicable safety requirements</li> <li>- excessive wear of chain drive sprockets and excessive chain stretch</li> <li>- electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.</li> </ul> <p>Verify that any deficiencies such as those listed above are carefully examined and</p>

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<p><b>MS.40.43.</b> Cranes which have been idle for a period of 1 month or more, but less than 6 months must be given inspections which satisfy certain requirements (29 CFR 1910.179(j)(4)(i)).</p>	<p>determination made as to whether they constitute a safety hazard.</p> <p>Determine whether a crane has been idle for a period of 1 mo or more, but less than 6 mo.</p> <p>Verify that such a crane is given an inspection conforming with requirements of 29 CFR 1910.179(j)(2) (see checklist item MS.40.41) and the other requirements of this checklist item before placing in service.</p> <p>Verify that all rope is given a thorough inspection before it is used.</p> <p>Verify that this rope inspection is for all types of deterioration.</p> <p>Verify that this rope inspection is performed by an appointed person whose approval is required for further use of the rope.</p> <p>Verify that a rope inspection certification record, which includes the following, is available for inspection:</p> <ul style="list-style-type: none"> <li>- the date of the inspection,</li> <li>- the signature of the person who performed the inspection, and</li> <li>- an identifier for the rope which was inspected.</li> </ul>
<p><b>MS.40.44.</b> Cranes which have been idle for a period of more than 6 months must be given inspections which satisfy certain requirements (29 CFR 1910.179(j)(4)(ii)).</p>	<p>Determine whether a crane has been idle for a period of over 6 mo.</p> <p>Verify that such a crane is given a complete inspection conforming with the requirements of 29 CFR 1910.179(j)(2) and 1910.179(j)(3) (see checklist items MS.40.41 and MS.40.42) and the other requirements of this checklist item before being placed in service.</p> <p>Verify that all rope is given a thorough inspection before it is used.</p> <p>Verify that this rope inspection is for all types of deterioration.</p> <p>Verify that this rope inspection is performed by an appointed person whose approval is required for further use of the rope.</p> <p>Verify that a rope inspection certification record, which includes the following, is available for inspection:</p> <ul style="list-style-type: none"> <li>- the date of the inspection</li> <li>- the signature of the person who performed the inspection</li> <li>- an identifier for the rope which was inspected.</li> </ul>
<p><b>MS.40.45.</b> Standby cranes must be inspected at least semi-annually in accordance</p>	<p>Verify that standby cranes are inspected at least semi-annually in accordance with the requirements of 29 CFR 1910.179(j)(2) (see checklist item MS.40.41)</p>

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with certain requirements (29 CFR 1910.179(j)(4)(iii)).	<p>and the other requirements of this checklist item.</p> <p>Verify that all rope is given a thorough inspection before it is used.</p> <p>Verify that this rope inspection is for all types of deterioration.</p> <p>Verify that this rope inspection is performed by an appointed person whose approval is required for further use of the rope.</p> <p>Verify that a rope inspection certification record, which includes the following, is available for inspection:</p> <ul style="list-style-type: none"> <li>- the date of the inspection</li> <li>- the signature of the person who performed the inspection</li> <li>- an identifier for the rope which was inspected.</li> </ul>
<b>MS.40.46.</b> All new and altered cranes must undergo operational tests which satisfy certain requirements (29 CFR 1910.179(k)(1)).	<p>Verify that, prior to initial use, all new and altered cranes are tested to ensure compliance with 29 CFR 1910.179 (see the checklist items in MS.40), including the following functions:</p> <ul style="list-style-type: none"> <li>- hoisting and lowering</li> <li>- trolley travel</li> <li>- bridge travel</li> <li>- limit switches, locking and safety devices.</li> </ul> <p>Verify that the trip setting of hoist limit switches is determined by tests with an empty hook traveling in increasing speeds up to the maximum speed.</p> <p>Verify that the actuating mechanism of the limit switch is located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.</p>
<b>MS.40.47.</b> Rated load tests must satisfy certain requirements (29 CFR 1910.179(k)(2)).	<p>Verify that test loads are not more than 125 percent of the rated load.</p> <p>(NOTE: This requirement does not apply if otherwise recommended by the manufacturer.)</p> <p>Verify that the test reports are placed on file where readily available to appointed personnel.</p>
<b>MS.40.48.</b> A preventive maintenance program must be established (29 CFR 1910.179(l)(1)).	<p>Verify that a preventive maintenance program based on the crane manufacturer's recommendations is established.</p>
<b>MS.40.49.</b> Certain procedures must be taken prior to	<p>Verify that, before adjustments and repairs are started on a crane, the following</p>

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<p>and after maintenance activities (29 CFR 1910.179(l)(2)).</p> <p><b>MS.40.50.</b> Adjustments and repairs must satisfy certain requirements (29 CFR 1910.179(l)(3)).</p>	<p>precautions are taken:</p> <ul style="list-style-type: none"> <li>- the crane to be repaired is run to a location where it will cause the least interference with other cranes and operations in the area</li> <li>- all controllers are at the off position</li> <li>- the main or emergency switch is open and locked in the open position</li> <li>- warning or OUT OF ORDER signs are placed on the crane, also on the floor beneath or on the hook where visible from the floor</li> <li>- where other cranes are in operation on the same runway, rail stops or other suitable means are provided to prevent interference with the idle crane.</li> </ul> <p>Verify that, after adjustments and repairs have been made, the crane is not operated until all guards have been reinstalled, safety devices reactivated and maintenance equipment removed.</p> <p>Verify that any unsafe conditions disclosed in the course of required inspections are corrected before operation of the crane is resumed.</p> <p>Verify that adjustments and repairs are done only by designated personnel.</p> <p>Verify that adjustments are maintained to ensure correct functioning of components.</p> <p>(NOTE: The following are examples of such components:</p> <ul style="list-style-type: none"> <li>- all functional operating mechanisms</li> <li>- limit switches</li> <li>- control systems</li> <li>- brakes</li> <li>- power plants.)</li> </ul> <p>Verify that repairs or replacements are provided promptly as needed for safe operation.</p> <p>(NOTE: The following are examples of such repairs or replacements:</p> <ul style="list-style-type: none"> <li>- crane hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 degree twist from the plane of the unbent hook must be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted, they are only to be done under competent supervision and the hook is to be tested according to the following requirements: <ul style="list-style-type: none"> <li>- test loads must not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer</li> <li>- the test reports must be placed on file where readily available to appointed personnel</li> </ul> </li> <li>- load attachment chains and rope slings showing the following defects: <ul style="list-style-type: none"> <li>- excessive wear</li> </ul> </li> </ul>

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<p><b>MS.40.51.</b> Running ropes must be inspected according to certain requirements (29 CFR 1910.179(m)(1)).</p>	<ul style="list-style-type: none"> <li>- twist</li> <li>- distorted links interfering with proper function or</li> <li>- stretch beyond manufacturer's recommendations</li> <li>- rope slings showing defects</li> <li>- all critical parts which are cracked, broken, bent, or excessively worn</li> <li>- pendant control stations must be kept clean and function labels kept legible.)</li> </ul> <p>Verify that a thorough inspection of all ropes is made at least once a month.</p> <p>Verify that a certification record which includes the following is kept on file where readily available to appointed personnel:</p> <ul style="list-style-type: none"> <li>- the date of the inspection</li> <li>- the signature of the person who performed the inspection</li> <li>- an identifier for the ropes which were inspected.</li> </ul> <p>Verify that any deterioration, resulting in appreciable loss of original stretch, is carefully observed and determination made as to whether further use of the rope would constitute a safety hazard.</p> <p>(NOTE: Some of the conditions that could result in an appreciable loss of strength are the following:</p> <ul style="list-style-type: none"> <li>- reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires</li> <li>- a number of broken outside wires and the degree of distribution or concentration of such broken wires</li> <li>- worn outside wires</li> <li>- corroded or broken wires at end connections</li> <li>- corroded, cracked, bent, worn, or improperly applied end connections</li> <li>- severe kinking, crushing, cutting, or unstranding.)</li> </ul> <p><b>MS.40.52.</b> Other ropes must be inspected according to certain requirements (29 CFR 1910.179(m)(2)).</p> <p>Verify that all rope which has been idle for period of a month or more due to shutdown or storage of the crane on which it is installed is given a thorough inspection before it is used.</p> <p>Verify that this inspection is for all types of deterioration.</p> <p>Verify that this inspection is performed by an appointed person whose approval is required for further use of the rope.</p> <p>Verify that a certification record, which includes the following, is available for inspection:</p> <ul style="list-style-type: none"> <li>- the date of the inspection</li> <li>- the signature of the person who performed the inspection</li> <li>- an identifier for the rope which was inspected.</li> </ul>

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<p><b>MS.40.53.</b> A crane must not be loaded beyond its rated load (29 CFR 1910.179(n)(1)).</p> <p><b>MS.40.54.</b> The load must be attached in accordance with certain requirements (29 CFR 1910.179(n)(2)).</p> <p><b>MS.40.55.</b> Loads must be moved only after certain requirements are satisfied (29 CFR 1910.179(n)(3)).</p>	<p>Verify that the crane is not loaded beyond its rated load.</p> <p>(NOTE: This requirement does not apply for test purposes. Test loads must not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer.)</p> <p>Verify that the hoist chain or hoist rope is free from kinks or twists and is not wrapped around the load.</p> <p>Verify that the load is attached to the load block hook by means of slings or other approved devices.</p> <p>Verify that care is taken to make certain that the sling clears all obstacles.</p> <p>Verify that the load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.</p> <p>Verify that, before starting to hoist, the following conditions are noted:</p> <ul style="list-style-type: none"> <li>- hoist rope is not kinked</li> <li>- multiple part lines are not twisted around each other</li> <li>- the hook is brought over the load in such a manner as to prevent swinging.</li> </ul> <p>Verify that, during hoisting, care is taken that:</p> <ul style="list-style-type: none"> <li>- there is no sudden acceleration or deceleration of the moving load</li> <li>- the load does not contact any obstructions.</li> </ul> <p>Verify that cranes are not used for side pulls.</p> <p>(NOTE: This requirement does not apply when specifically authorized by a responsible person who has determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed.)</p> <p>Verify that, while any employee is on the load or hook, there is no hoisting, lowering, or traveling.</p> <p>Verify that the installation requires that the operator avoid carrying loads over people.</p> <p>Verify that the operator tests the brakes each time a load approaching the rated load is handled.</p> <p>Verify that the brakes are tested by raising the load a few inches and applying the brakes.</p> <p>Verify that the load is not lowered below the point where less than two full wraps</p>

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<p><b>MS.40.56.</b> Hoist limit switch operation must satisfy certain requirements (29 CFR 1910.179(n)(4)).</p> <p><b>MS.40.57.</b> Ladder usage must satisfy certain requirements (29 CFR 1910.179(o)(1)).</p> <p><b>MS.40.58.</b> Cabs must be kept organized (29 CFR 1910.179(o)(2)).</p> <p><b>MS.40.59.</b> The installation must ensure that operators are familiar with the operation and care of fire extinguishers provided (29 CFR 1910.179(o)(2)).</p>	<p>of rope remain on the hoisting drum.</p> <p>Verify that, when two or more cranes are used to lift a load, one qualified responsible person is in charge of the operation.</p> <p>Verify that this person analyzes the operation and instructs all personnel involved in the proper positioning, rigging of the load, and the movements to be made.</p> <p>Verify that the installation ensures that the operator does not leave his position at the controls while the load is suspended.</p> <p>Verify that, when starting the bridge and when the load or hook approaches near or over personnel, the warning signal is sounded.</p> <p>Verify that, at the beginning of each operator's shift, the upper limit switch of each hoist is tried out under no load.</p> <p>Verify that extreme care is exercised.</p> <p>Verify that the block is "inched" into the limit or run in at slow speed.</p> <p>Verify that, if the switch does not operate properly, the appointed person is immediately notified.</p> <p>Verify that the hoist limit switch which controls the upper limit of travel of the load block is never used as an operating control.</p> <p>Verify that the installation ensures that hands are free from encumbrances while personnel are using ladders.</p> <p>Verify that articles which are too large to be carried in pockets or belts are lifted and lowered by hand line.</p> <p>Verify that necessary clothing and personal belongings are not stored in such a manner as to interfere with access or operation.</p> <p>Verify that tools, oil cans, waste, extra fuses, and other necessary articles are stored in the tool box, and are not permitted to lie loose in or about the cab.</p> <p>Verify that the installation ensures that operators are familiar with the operation and care of fire extinguishers provided.</p>



## Appendix 48-1

See 29 CFR 1910.178, Table N-1.



## **CHAPTER 49**

### **MACHINERY AND MACHINE GUARDING**

## CHAPTER 49

### SAFETY: MACHINERY AND MACHINE GUARDING

#### ECAMP-ANG

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#### Compliance Definitions

- *Abrasive Wheel* - a cutting tool consisting of abrasive grains held together by organic or inorganic bonds. Diamond and reinforced wheels are included (29 CFR 1910.211(b)(14)).
- *Cutting Off Wheels* - wheels having diameter thickness and hole size dimensions and are subject to all limitations of mounting and use listed for Type 1 wheels (29 CFR 1910.211(b)(13)).

(LIMITATIONS: Cutting off wheels are recommended for use only on specially designed and fully guarded machines and are subject to the following maximum thickness and hole size limitations:

- 6 in. and smaller wheel diameter -- 3/18 in. maximum thickness
- larger than 6 in. to 12 in. wheel diameter -- 1/4 in. maximum thickness
- larger than 12 in. to 23 in. wheel diameter -- 3/8 in. maximum thickness
- larger than 23 in. wheel diameter -- 1/2 in. maximum thickness.

Maximum hole size for cutting-off wheels must not be larger than 1/4-wheel diameter.)

- *Flanges* - collars, discs or plates between which wheels are mounted and are referred to as adaptor, sleeve, or back up type (29 CFR 1910.211(b)(9)).
- *Inorganic Wheels* - wheels which are bonded by means of inorganic material such as clay, glass, porcelain, sodium silicate, magnesium oxychloride, or metal. Wheels bonded with clay, glass, porcelain, or related ceramic materials are characterized as *vitrified bonded wheels* (29 CFR 1910.211(b)(16)).
- *Modified Types 6 and 11 Wheels (Terrazzo)* - some Type 6 and 11 cup wheels used in the terrazzo trade having tapered K (inside flat) dimensions to match a special tapered flange furnished by the machine builder. See 29 CFR 1910.211, Fig. No. 0-5 (29 CFR 1910.211(b)(5)).

(LIMITATION: These wheels must be mounted only with a special tapered flange.)

- *Off-Hand Grinding* - the grinding of any material or part which is held in the operator's hand (29 CFR 1910.211(b)(11)).
- *Safety Guard* - (an abrasive wheel term) an enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation (29 CFR 1910.241(b)(6) and 1910.211(b)(12)).
- *Snagging* - grinding which removes relatively large amounts of material without regard to close tolerances or surface finish requirements (29 CFR 1910.211(b)(10)).
- *Surface Feet Per Minute (s.f.p.m)* - the distance in feet any one abrasive grain on the peripheral surface of a grinding wheel travels in 1 minute (29 CFR 1910.211(b)(8)).

Surface Feet Per Minute =  $3.1416 \times \text{diameter (in inches)} \times \text{r.p.m.} + 12$  or  $0.262 \times \text{diameter (in inches)} \times \text{r.p.m.}$

(EXAMPLES:

24-in. diameter wheel, 1000 r.p.m. Surface Feet Per Minute =  $0.262 \times 24 \times 1000 = 6288$  s.f.p.m.

12-in. diameter wheel, 1000 r.p.m. Surface Feet Per Minute =  $0.262 \times 12 \times 1000 = 3144$  s.f.p.m.)

- *Type 1 Straight Wheels* - wheels having diameter, thickness, and hole size dimensions. They should be used only on the periphery. Type 1 wheels must be mounted between flanges. (See Fig. 0-1, 29 CFR 1910.211(b)(1) and Fig. P-3, 29 CFR 1910.241(b)(10)).

(LIMITATION: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other applications should not exceed one-half wheel diameter.)

- *Type 2 Cylinder Wheels* - wheels having diameter, wheel thickness, and rim thickness dimensions. Grinding is performed on the rim face only (dimension W). Cylinder wheels may be plain, plate mounted, inserted nut, or of the projecting stud type. See 29 CFR 1910.211, Fig. No. 0-2 (29 CFR 1910.211(b)(2)).

(LIMITATION: Rim height (T dimension) is generally equal to or greater than rim thickness (W dimension).)

- *Type 6 Straight Cup Wheels* - wheels having diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on the rim face (W dimension). See 29 CFR 1910.211, Fig. No. 0-3 (29 CFR 1910.211(b)(3)).

(LIMITATION: Minimum back thickness (E dimension) must not be less than one-fourth rim height (T dimension). In addition, when unthreaded hole wheels are specified, the inside flat (K dimension) must be large enough to accommodate a suitable flange.)

- *Type 11 Flaring Cup Wheels* - wheels having double diameter dimensions D and J, and in addition have thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face (W dimension). Type 11 wheels are subject to all limitations of use and mounting listed for *Type 6 Straight Sided Cup Wheels* definition. See 29 CFR 1910.211, Fig. No. 0-4 (29 CFR 1910.211(b)(4)).

(LIMITATION: Minimum back thickness (E dimension) should not be less than one-fourth rim height (T dimension). In addition, when unthreaded hole wheels are specified, the inside flat (K dimension) must be large enough to accommodate a suitable flange.)

- *Type 27A Depressed Center, Cutting-Off Wheels* - wheels having diameter, thickness, and hole size dimensions. They are reinforced, organic bonded, offset hub type wheels, usually 16-in. diameter and larger, specially designed for use on cutting-off machines where mounting nut or outer flange interference cannot be tolerated (29 CFR 1910.211(b)(7)).

(LIMITATIONS: Specific flanges are required for the proper mounting of these types of wheels.)

- *Types 27 and 28 Depressed Center Wheels* - wheels having diameter, thickness, and hole size dimensions. Both types are reinforced, organic bonded wheels having offset hubs which permit side and peripheral grinding operations without interference with the mounting. Type 27 wheels are manufactured with flat grinding rims permitting notching and cutting operations. Type 28 wheels have saucer shaped grinding rims (29 CFR 1910.211(b)(6)).

(LIMITATIONS: Special supporting, back adapter, and inside flange nuts are required for the proper mounting of these types of wheels. Mounts which are affixed to the wheel by the manufacturer must not require an inside nut and must not be reused.)

## SAFETY: MACHINERY AND MACHINE GUARDING

### GUIDANCE FOR CHECKLIST USERS

	REFER TO CHECKLIST ITEMS:	REFER TO PAGE NUMBERS:
General Requirements for All Machines	MG.10.1 through MG.10.6	49-5
Woodworking Machinery Requirements	MG.20.1 through MG.20.19	49-7
Abrasive Wheel Machinery		
General Requirements	MG.30.1 through MG.30.3	49-21
Guarding of Abrasive Wheel Machinery	MG.40.1 through MG.40.9	49-23
Flanges	MG.50.1 through MG.50.7	49-27
Mounting	MG.60.1 through MG.60.6	49-31

Appendix 49-1, *Maximum Basic Thicknesses of Peripheral and Side Members for Safety Guards* See 29 CFR 1910.215, Table O-9.

Appendix 49-2, *Maximum Basic Thicknesses of Peripheral and Side Members for Safety Guards Used with Cutting-Off Wheels* See 29 CFR 1910.215, Table O-1.

Appendix 49-3, *Exposure Versus Wheel Thickness* 49-39

Appendix 49-4, *Minimum Dimensions for Straight Relieved Flanges* 49-41

Appendix 49-5, *Minimum Dimensions for Straight Flanges -- For Mechanical Grinders 12,500 S.F.P.M. to 16,500 S.F.P.M.* 49-43

Appendix 49-6, *Minimum Dimensions for Straight Unrelieved Flanges for Wheels with Threaded Inserts or Projecting Studs* 49-45

Appendix 49-7, *Minimum Dimensions for Straight Adaptor Flange -- For Organic Bonded Wheels Over 1 1/4 Inches Thick* 49-47

Appendix 49-8, *Minimum Dimensions for Straight Flanges Used as Wheel Sleeves for Precision Grinding Only* 49-49



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<p><b>MG.10</b>  <b>GENERAL</b>  <b>REQUIREMENTS FOR</b>  <b>ALL MACHINES</b></p> <p><b>MG.10.1.</b> One or more methods of machine guarding must be provided (29 CFR 1910.212(a)(1)).</p> <p><b>MG.10.2.</b> Guards must satisfy certain general requirements (29 CFR 1910.212(a)(2)).</p> <p><b>MG.10.3.</b> Point of operation guarding must satisfy certain requirements (29 CFR 1910.212(a)(3)).</p>	<p>Verify that one or more methods of machine guarding is provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, in-going nip points, rotating parts, flying chips, and sparks.</p> <p>(NOTE: Examples of guarding methods are: barrier guards, two-hand tripping devices, electronic safety devices, etc.)</p> <p>Verify that guards are affixed to the machine where possible and secured elsewhere if, for any reason, attachment to the machine is not possible.</p> <p>Verify that the guard is such that it does not offer an accident hazard in itself.</p> <p>(NOTE: <i>Point of operation</i> is the area on a machine where work is actually performed upon the material being processed.)</p> <p>Verify that the point of operation of machines whose operation exposes an employee to injury is guarded.</p> <p>Verify that the guarding device is either:</p> <ul style="list-style-type: none"> <li>- in conformity with any appropriate standards therefor or</li> <li>- so designed and constructed, in the absence of applicable specific standards, as to prevent the operator from having any part of his/her body in the danger zone during the operating cycle.</li> </ul> <p>Verify that special handtools for placing and removing material are such as to permit easy handling of material without the operator placing a hand in the danger zone.</p> <p>Verify that such tools are not used in lieu of other required guarding, but are used only to supplement protection provided.</p> <p>(NOTE: The following are some of the machines which usually require point of operation guarding:</p> <ul style="list-style-type: none"> <li>- guillotine cutters</li> <li>- shears</li> <li>- alligator shears</li> <li>- power presses</li> <li>- milling machines</li> </ul>

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<p><b>MG.10.4.</b> Revolving drums, barrels, and containers must be guarded (29 CFR 1910.212(a)(4)).</p> <p><b>MG.10.5.</b> Fan blades must be guarded in certain situations (29 CFR 1910.212(a)(5)).</p> <p><b>MG.10.6.</b> Fixed machinery must be anchored (29 CFR 1910.212(b)).</p>	<ul style="list-style-type: none"> <li>- power saws</li> <li>- jointers</li> <li>- portable power tools</li> <li>- forming rolls and calenders.)</li> </ul> <p>Verify that revolving drums, barrels, and containers are guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.</p> <p>Verify that the blades of a fan are guarded when the periphery of the blades is less than 7 ft above the floor or working level.</p> <p>Verify that this guard has openings no larger than 1/2 in.</p> <p>Verify that machines designed for a fixed location are securely anchored to prevent walking or moving.</p>

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<p><b>MG.20</b>  <b>WOODWORKING</b>  <b>MACHINERY</b>  <b>REQUIREMENTS</b></p> <p><b>MG.20.1.</b> Machine construction must satisfy certain general requirements (29 CFR 1910.213(a)).</p>	<p>(NOTE: The mention of specific machines in 29 CFR 1910.213 (see the checklist items in MG.30) is not intended to exclude other wood working machines from the requirement that suitable guards and exhaust hoods be provided to reduce to a minimum the hazard due to the point of operation of such machines.)</p> <p>Verify that each machine is so constructed as to be free from sensible vibration when the largest size tool is mounted and run idle at full speed.</p> <p>Verify that arbors and mandrels are constructed so as to have firm and secure bearing and be free from play.</p> <p>Verify that no automatic cutoff saws are used that stroke continuously without the operator being able to control each stroke.</p> <p>Verify that saw frames or tables are constructed with lugs cast on the frame or with an equivalent means to limit the size of the saw blade that can be mounted, so as to avoid overspeed caused by mounting a saw larger than intended.</p> <p>Verify that circular saw fences are so constructed that they can be firmly secured to the table or table assembly without changing their alignment with the saw.</p> <p>Verify that, for saws with tilting tables or tilting arbors, the fence is so constructed that it will remain in a line parallel with the saw, regardless of the angle of the saw with the table.</p> <p>Verify that circular saw gages are so constructed as to slide in grooves or tracks that are accurately machined, to ensure exact alignment with the saw for all positions of the guide.</p> <p>Verify that hinged saw tables are so constructed that the table can be firmly secured in any position and in true alignment with the saw.</p> <p>Verify that all belts, pulleys, gears, shafts, and moving parts are guarded in accordance with the specific requirements of 29 CFR 1910.219.</p> <p>(NOTE: It is recommended that each power-driven woodworking machine be provided with a disconnect switch that can be locked in the off position.)</p> <p>Verify that the frames and all exposed, noncurrent-carrying metal parts of portable electric woodworking machinery operated at more than 90 volts to ground are grounded.</p> <p>Verify that other portable motors driving electric tools, which are held in the hand while being operated, are grounded if they operate at more than 90 volts to</p>

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<p><b>MG.20.2.</b> Machine controls and equipment must comply with certain requirements (29 CFR 1910.213(b)).</p>	<p>ground.</p> <p>Verify that the ground is provided through use of a separate ground wire and polarized plug and receptacle.</p> <p>Determine whether, for all circular saws, conditions are such that there is a possibility of contact with the portion of the saw either beneath or behind the table.</p> <p>Verify that portion of the saw is either:</p> <ul style="list-style-type: none"> <li>- covered with an exhaust hood or</li> <li>- with a guard that is so arranged as to prevent accidental contact with the saw, if no exhaust system is required.</li> </ul> <p>Verify that revolving double arbor saws are fully guarded in accordance with all the requirements for circular crosscut saws (29 CFR 1910.213(c) and 1910.213(f)(2) (see checklist items MG.20.3 and MG.20.6)) or with all the requirements for circular ripaws (29 CFR 1910.213(d) (see checklist item MG.20.4)), according to the kind of saws mounted on the arbors.</p> <p>Verify that no saw, cutter head, or tool collar is placed or mounted on a machine arbor.</p> <p>(NOTE: This requirement does not apply if the tool has been accurately machined to size and shape to fit the arbor.)</p> <p>Verify that combs (featherboards) or suitable jigs are provided at the workplace for use when a standard guard cannot be used, as in dadoing, grooving, jointing, moulding, and rabbeting.</p> <p>Verify that a mechanical or electrical power control is provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation.</p> <p>Verify that a locking-type belt shifter or an equivalent positive device is used on machines driven by belts and shafting.</p> <p>Verify that, on applications where injury to the operator might result if motors were to restart after power failures, provisions are made to prevent machines from automatically restarting upon restoration of power.</p> <p>Verify that power controls and operating controls are located within easy reach of the operator while at the regular work location, making it unnecessary to reach over the cutter to make adjustments.</p> <p>(NOTE: This requirement does not apply to constant pressure controls used only</p>

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<p><b>MG.20.3.</b> Hand-fed ripsaws must satisfy certain requirements (29 CFR 1910.213(c)).</p>	<p>for set-up purposes.)</p> <p>Verify that, on each machine operated by electric motors, positive means is provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.</p> <p>Verify that each operating treadle is protected against unexpected or accidental tripping.</p> <p>Verify that feeder attachments have the feed rolls or other moving parts so covered or guarded as to protect the operator from hazardous points.</p> <p>Verify that each circular hand-fed ripsaw is guarded by a hood which completely encloses that portion of the saw above the table and that portion of the saw above the material being cut.</p> <p>Verify that the hood and mounting is arranged so that the hood:</p> <ul style="list-style-type: none"> <li>- will automatically adjust itself to the thickness of and remain in contact with the material being cut but</li> <li>- does not offer any considerable resistance to insertion of material to the saw or to passage of the material being sawed.</li> </ul> <p>Verify that the hood is made of adequate strength to resist blows and strains incidental to reasonable operation, adjusting, and handling.</p> <p>Verify that the hood is so designed as to protect the operator from flying splinters and broken saw teeth.</p> <p>Verify that the hood is made of material that is soft enough so that it will be unlikely to cause tooth breakage.</p> <p>Verify that the hood is so mounted as to ensure that its operation will be positive, reliable, and in true alignment with the saw.</p> <p>Verify that the mounting is adequate in strength to resist any reasonable side thrust or other force tending to throw it out of line.</p> <p>Verify that each hand-fed circular ripsaw is furnished with a spreader to prevent material from squeezing the saw or being thrown back on the operator.</p> <p>Verify that the spreader is made of hard tempered steel, or its equivalent.</p> <p>Verify that the spreader is thinner than the saw kerf.</p> <p>Verify that the spreader is of sufficient width to provide adequate stiffness or rigidity to resist any reasonable side thrust or blow tending to bend or throw it out</p>

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<p><b>MG.20.4.</b> Circular crosscut table saws must be guarded by hoods which satisfy certain requirements (29 CFR 1910.213(d)).</p>	<p>to position.</p> <p>Verify that the spreader is attached so that it will remain in true alignment with the saw even when either the saw or table is tilted.</p> <p>(NOTE: The provision of a spreader in connection with grooving, dadoing, or rabbeting is not required.)</p> <p>Verify that the spreader is immediately replaced after grooving, dadoing, or rabbeting.</p> <p>Verify that each hand-fed circular rip saw is provided with nonkickback fingers or dogs so located as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator.</p> <p>Verify that these nonkickback fingers or dogs are designed to provide adequate holding power for all the thicknesses of materials being cut.</p> <p>Verify that each circular crosscut table saw is guarded by a hood which completely encloses that portion of the saw above the table and that portion of the saw above the material being cut.</p> <p>Verify that the hood and mounting is arranged so that the hood:</p> <ul style="list-style-type: none"> <li>- will automatically adjust itself to the thickness of and remain in contact with the material being cut but</li> <li>- does not offer any considerable resistance to insertion of material to the saw or to passage of the material being sawed.</li> </ul> <p>Verify that the hood is made of adequate strength to resist blows and strains incidental to reasonable operation, adjusting, and handling.</p> <p>Verify that the hood is so designed as to protect the operator from flying splinters and broken saw teeth.</p> <p>Verify that the hood is made of material that is soft enough so that it will be unlikely to cause tooth breakage.</p> <p>Verify that the hood is so mounted as to ensure that its operation will be positive, reliable, and in true alignment with the saw.</p> <p>Verify that the mounting is adequate in strength to resist any reasonable side thrust or other force tending to throw it out of line.</p>
<p><b>MG.20.5.</b> Circular resaws must satisfy certain require-</p>	<p>Verify that each circular resaw is guarded by a hood or shield of metal above the saw.</p>

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<p>ments (29 CFR 1910.213(e)).</p> <p><b>MG.20.6.</b> Self-feed circular saws must satisfy certain requirements (29 CFR 1910.213(f)).</p> <p><b>MG.20.7.</b> Swing cutoff saws must satisfy certain requirements (29 CFR 1910.213(g)).</p>	<p>Verify that this hood or shield is so designed as to guard against danger from flying splinters or broken saw teeth.</p> <p>Verify that each circular resaw (other than self-feed saws with a roller or wheel at the back of the saw) is provided with a spreader fastened securely behind the saw.</p> <p>Verify that the spreader is slightly thinner than the saw kerf and slightly thicker than the saw disk.</p> <p>Verify that the feed rolls and saws are protected by a hood or guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point.</p> <p>Verify that the guard is constructed of heavy material, preferably metal.</p> <p>Verify that the bottom of the guard comes down to within 3/8 in. of the plane formed by the bottom or working surfaces of the feed rolls.</p> <p>(NOTE: This distance (3/8 in.) may be increased to 3/4 in., provided the lead edge of the hood is extended to be not less than 5.5 in. in front of the nip point between the front roll and the work.)</p> <p>Verify that each self-feed circular ripsaw is provided with sectional nonkickback fingers for the full width of the feed rolls.</p> <p>Verify that these nonkickback fingers are located in front of the saw and so arranged as to be in continual contact with the wood being fed.</p> <p>(NOTE: The requirements of this checklist item are also applicable to sliding cutoff saws mounted above the table.)</p> <p>Verify that each swing cutoff saw is provided with a hood that will completely enclose:</p> <ul style="list-style-type: none"> <li>- the upper half of the saw</li> <li>- the arbor end</li> <li>- the point of operation at all positions of the saw.</li> </ul> <p>Verify that the hood is constructed in such a manner and of such material that it will protect the operator from flying splinters and broken saw teeth.</p> <p>Verify that the hood is so designed that it will automatically cover the lower portion of the blade, so that:</p> <ul style="list-style-type: none"> <li>- when the saw is returned to the back of the table, the hood will rise on top of the fence and</li> <li>- when the saw is moved forward, the hood will drop on top of and remain in</li> </ul>

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<p><b>MG.20.8.</b> Radial saws must satisfy certain requirements (29 CFR 1910.213(h)).</p>	<p>contact with the table or material being cut.</p> <p>Verify that each swing cutoff saw is provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel.</p> <p>Verify that such a device does not depend for its proper functioning upon any rope, cord, or spring.</p> <p>Verify that the bolts supporting the bar and counterweight are provided with cotter pins, if there is a counterweight.</p> <p>Verify that the counterweight is prevented from dropping by either:</p> <ul style="list-style-type: none"> <li>- a bolt passing through both the bar and counterweight</li> <li>- a bolt put through the extreme end of the bar, or</li> <li>- a safety chain attached to the counterweight, where the counterweight does not encircle the bar.</li> </ul> <p>Verify that limit chains or other equally effective devices are provided to prevent the saw from swinging beyond either:</p> <ul style="list-style-type: none"> <li>- the front or back edges of the table, or</li> <li>- a forward position where the gullets of the lowest saw teeth will rise above the table top.</li> </ul> <p>Verify that inverted swing cutoff saws are provided with a hood that will cover the part of the saw that protrudes above the top of the table or above the material being cut.</p> <p>Verify that the hood automatically adjusts itself to the thickness of and remains in contact with the material being cut.</p> <p>Verify that the upper hood completely encloses the upper portion of the blade down to a point that will include the end of the saw arbor.</p> <p>Verify that the upper hood is constructed in such a manner and of such material that it will:</p> <ul style="list-style-type: none"> <li>- protect the operator from flying splinters, broken saw teeth, etc.</li> <li>- will deflect sawdust away from the operator.</li> </ul> <p>Verify that the sides of the lower exposed portion of the blade are guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with stock being cut to give maximum protection possible for the operation being performed.</p>

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<p><b>MG.20.9.</b> Bandsaws and band resaws must satisfy certain requirements (29 CFR 1910.213(i)).</p>	<p>Verify that each radial saw used for ripping is provided with nonkickback fingers or dogs located on both sides of the saw so as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator.</p> <p>Verify that these nonkickback fingers or dogs are designed to provide adequate holding power for all the thicknesses of material being cut.</p> <p>Verify that, in repetitive operations, an adjustable stop is provided to prevent the forward travel of the blade beyond the position necessary to complete the cut.</p> <p>Verify that the saw is installed with the front end of the unit will be slightly higher than the rear, so as to cause the cutting head to return gently to the starting position when released by the operator.</p> <p>Verify that ripping and ploughing is against the direction in which the saw turns.</p> <p>Verify that the direction of the saw rotation is conspicuously marked on the hood.</p> <p>Verify that a permanent label not less than 1.5 in. by 3/4 in. is affixed to the rear of the guard at approximately the level of the arbor reading as follows:</p> <p style="text-align: center;">DANGER: DO NOT RIP OR PLOUGH FROM THIS END.</p> <p>(NOTE: This label is in addition to the required rotation mark on the hood.)</p> <p>Verify that all portions of the saw blade are enclosed or guarded.</p> <p>(NOTE: This requirement does not apply for the working portion of the blade between the bottom of the guide rolls and the table.)</p> <p>Verify that bandsaw wheels are fully encased.</p> <p>Verify that the outside periphery of the enclosure is solid.</p> <p>Verify that the front and back of the band wheels are either enclosed by solid material or wire mesh or perforated metal.</p> <p>Verify that such mesh or perforated metal:</p> <ul style="list-style-type: none"> <li>- is not less than 0.037 in. (U.S. Gage No. 20)</li> <li>- the openings are not greater than 3/8 in.</li> </ul> <p>Verify that the solid material used for this purpose is of an equivalent strength and firmness.</p> <p>Verify that the guard for the portion of the blade between the sliding guide and the upper-sawwheel guard protects the saw blade at the front and outer side.</p>

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<p><b>MG.20.10.</b> Jointers must satisfy certain requirements (29 CFR 1910.213(j)).</p>	<p>Verify that this portion of the guard is self-adjusting to raise and lower with the guide.</p> <p>Verify that the upper-wheel guard is made to conform to the travel of the saw on the wheel.</p> <p>Verify that each bandsaw machine is provided with a tension control device to indicate a proper tension for the standard saws used on the machine, in order to assist in the elimination of saw breakage due to improper tension.</p> <p>Verify that feed rolls of band resaws are protected with a suitable guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point.</p> <p>Verify that this guard is constructed of heavy material, preferably metal.</p> <p>Verify that the edge of the guard comes to within 3/8 in. of the plane formed by the inside face of the feed roll in contact with the stock being cut.</p> <p>Verify that each hand-fed planer and jointer with horizontal head is equipped with a cylindrical cutting head, the knife projection of which does not exceed 1/8 in. beyond the cylindrical body of the head.</p> <p>Verify that the opening in the table is kept as small as possible.</p> <p>Verify that the clearance between the edge of the rear table and the cutter head is not more than 1/8 in.</p> <p>Verify that the table throat opening is not more than 2.5 in. when tables are set or aligned with each other for zero cut.</p> <p>Verify that each hand-fed jointer with a horizontal cutting head has an automatic guard which will cover all of the section of the head on the working side of the fence or gage.</p> <p>Verify that this guard effectively keeps the operator's hands from coming in contact with the revolving knives.</p> <p>Verify that the guard automatically adjusts itself to cover the unused portion of the head and remains in contact with the material at all times.</p> <p>Verify that each hand-fed jointer with horizontal cutting head has a guard which will cover the section of the head back of the gage or fence.</p> <p>Verify that each wood jointer with vertical head has either an exhaust hood or other guard so arranged as to enclose completely the revolving head.</p> <p>(NOTE: The hood or guard does not have to enclose a slot of such width as may</p>

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<p><b>MG.20.11.</b> Tenoning machines must satisfy certain requirements (29 CFR 1910.213(k)).</p>	<p>be necessary and convenient for the application of the material to be jointed.)</p> <p>Verify that feed chains and sprockets of all double end tenoning machines are completely enclosed.</p> <p>(NOTE: This requirement does not apply to that portion of chain used for conveying the stock.)</p> <p>Verify that, at the rear ends of frames over which feed conveyors run, sprockets and chains are guarded at the sides by plates projecting beyond the periphery of sprockets and the ends of lugs.</p> <p>Verify that each tenoning machine has all cutting heads and saws (if used) covered by metal guards.</p> <p>Verify that these guards cover at least the unused part of the periphery of the cutting head.</p> <p>Verify that the material used for these guards has a thickness of not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 3/16 in., if cast iron is used.</li> </ul> <p>Verify that the guard forms part or all of the exhaust hood (where an exhaust system is used) and is constructed of metal of a thickness not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 3/16 in., if cast iron is used.</li> </ul>
<p><b>MG.20.12.</b> Boring and mortising machines must satisfy certain requirements (29 CFR 1910.213(l)).</p>	<p>Verify that safety-bit chucks with no projecting set screws are used.</p> <p>Verify that boring bits are provided with a guard that will enclose all portions of the bit and chuck above the material being worked.</p> <p>Verify that the top of the cutting chain and driving mechanism are enclosed.</p> <p>Verify that one of the following or equivalent means is used to prevent a counterweight (if provided) from dropping:</p> <ul style="list-style-type: none"> <li>- the counterweight is bolted to the bar by means of a bolt passing through both bar and counterweight</li> <li>- a bolt is put through the extreme end of the bar</li> <li>- a safety chain is attached to it, where the counterweight does not encircle the bar</li> <li>- other types of counterweights must be suspended by a chain or wire rope and travel in a pipe or other suitable enclosure wherever they might fall and cause injury.</li> </ul>

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<p><b>MG.20.13.</b> Wood shapers and similar equipment must satisfy certain requirements (29 CFR 1910.213(m)).</p>	<p>Verify that universal joints on spindles of boring machines are completely enclosed in such a way as to prevent accidental contact by the operator.</p> <p>Verify that each operating treadle is covered by an inverted U-shaped metal guard, fastened to the floor, and of adequate size to prevent accidental tripping.</p> <p>Verify that the cutting heads of each wood shaper, hand-fed panel raiser, or other similar machine not automatically fed, are enclosed with a cage or adjustable guard so designed as to keep the operator's hand away from the cutting edge.</p> <p>Verify that the diameter of circular shaper guards is not less than the greatest diameter of the cutter.</p> <p>Verify that there is no warning device of leather, or other material, attached to the spindle.</p> <p>Verify that all double-spindle shapers are provided with a spindle starting and stopping device for each spindle.</p>
<p><b>MG.20.14.</b> Planing, molding, sticking, and matching machines must satisfy certain requirements (29 CFR 1910.213(n)).</p>	<p>Verify that each planing, molding, sticking, and matching machine has all cutting heads, and saws (if used) covered by a metal guard.</p> <p>Verify that the material used for this guard has a thickness of not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 1/16 in. in, if cast iron is used.</li> </ul> <p>Verify that the guards form part or all of the exhaust hood (where an exhaust system is used) and are constructed of metal of a thickness not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 3/16 in. in, if cast iron is used.</li> </ul> <p>Verify that feed rolls are guarded by a hood or suitable guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point.</p> <p>Verify that the guard is fastened to the frame carrying the rolls so as to remain in adjustment for any thickness of stock.</p> <p>Verify that surfacers or planers used in thicknessing multiple pieces of material simultaneously are provided with sectional infeed rolls.</p> <p>Verify that these sectional infeed rolls have sufficient yield in the construction of the sections to provide feeding contact pressure on the stock, over the permissible range of variation in stock thickness specified or for which the machine is de-</p>

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<p><b>MG.20.15.</b> Profile and swing-head lathes and wood heel turning machines must satisfy certain requirements (29 CFR 1910.213(o)).</p>	<p>signed.</p> <p>Verify that, in lieu of such yielding sectional rolls, suitable section kickback finger devices are provided at the infeed end.</p> <p>Verify that each profile and swing-head lathe has all cutting heads covered by a metal guard.</p> <p>Verify that the material used for this guard has a thickness of not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 3/16 in. in, if cast iron is used.</li> </ul> <p>Verify that cutting heads on wood-turning lathes, whether rotating or not, are covered as completely as possible by hoods or shields.</p> <p>Verify that shoe last and spoke lathes, doweling machines, wood heel turning machines, and other automatic wood-turning lathes of the rotating knife type are equipped with hoods enclosing the cutter blades completely.</p> <p>(NOTE: The hoods do not have to enclose the blades at the contact points while the stock is being turned.)</p> <p>Verify that lathes used for turning long pieces of wood stock held only between the two centers are equipped with long curved guards extending over the tops of the lathes in order to prevent the work pieces from being thrown out of the machines if they should become loose.</p> <p>Verify that the guard forms part or all of the exhaust hood (where an exhaust system is used) and are constructed of metal of a thickness not less than:</p> <ul style="list-style-type: none"> <li>- 1/16 in., if such a guard is constructed of sheet metal</li> <li>- 3/16 in. in, if cast iron is used.</li> </ul>
<p><b>MG.20.16.</b> Sanding machines must satisfy certain requirements (29 CFR 1910.213(p)).</p>	<p>Verify that feed rolls of self-feed sanding machines are protected with a semi-cylindrical guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point.</p> <p>Verify that the guard is constructed of heavy material, preferably metal</p> <p>Verify that the guard is firmly secured to the frame carrying the rolls so as to remain in adjustment for any thickness of stock.</p> <p>Verify that the bottom of the guard comes down to within 3/8 in. of a plane formed by the bottom or contact face of the feed roll where it touches the stock.</p> <p>Verify that each drum sanding machine has an exhaust hood, or other guard if no</p>

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<p><b>MG.20.17.</b> Veneer cutters and wringers must satisfy certain requirements (29 CFR 1910.213(q)).</p>	<p>exhaust system is required, so arranged as to enclose the revolving drum.</p> <p>(NOTE: The hood or guard does not have to enclose that portion of the drum above the table, if a table is used, which may be necessary and convenient for the application of the material to be finished.)</p> <p>Verify that belt sanding machines are provided with guards at each nip point where the sanding belt runs on to a pulley.</p> <p>Verify that these guards effectively prevent the hands or fingers of the operator from coming in contact with the nip points.</p> <p>Verify that the unused run of the sanding belt is guarded against accidental contact.</p> <p>Verify that veneer slicer knives are guarded to prevent accidental contact with knife edge, at both front and rear.</p> <p>Verify that veneer clippers either:</p> <ul style="list-style-type: none"> <li>- have automatic feed or</li> <li>- are provided with a guard which will make it impossible to place a finger or fin-gers under the knife while feeding or removing the stock.</li> </ul> <p>Verify that sprockets on chain or slat-belt conveyors are enclosed.</p> <p>Verify that, where practicable, hand and footpower guillotine veneer cutters are provided with rods or plates or other satisfactory means, so arranged on the feeding side that the hands cannot reach the cutting edge of the knife while feeding or holding the stock in place.</p> <p>Verify that power-driven guillotine veneer cutters are equipped with either:</p> <ul style="list-style-type: none"> <li>- starting devices which require the simultaneous action of both hands to start the cutting motion and at least one hand on a control during the complete stroke of the knife or</li> <li>- an automatic guard: <ul style="list-style-type: none"> <li>- which will remove the hands of the operator from the danger zone at every descent of the blade, used in conjunction with one-hand starting devices which require two distinct movements of the device to start the cutting motion and</li> <li>- so designed as to return positively to the nonstarting position after each complete cycle of the knife.</li> </ul> </li> </ul> <p>(NOTE: This requirement does not apply to continuous feed trimmers.)</p>



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	<p>Verify that bearings are well lubricated.</p> <p>Verify that arbors of all circular saws are free from play.</p> <p>Verify that sharpening or tensioning of saw blades or cutters is done only by persons of demonstrated skill in this kind of work.</p> <p>Verify that the following is emphasized:</p> <ul style="list-style-type: none"> <li>- the importance of maintaining cleanliness around woodworking machinery, particularly as regards the effective functioning of guards</li> <li>- the prevention of fire hazards in switch enclosures, bearings, and motors.</li> </ul> <p>Verify that all cracked saws are removed from service.</p> <p>Verified that wedges are not inserted between the saw disk and the collar to form what is commonly known as a "wobble saw."</p> <p>Verify that push sticks or push blocks are provided at the work place in several sizes and types suitable for the work to be done.</p> <p>Verify that the knife blade of jointers is so installed and adjusted that it does not protrude more than 1/8 in. beyond the cylindrical body of the head.</p> <p>Verify that, whenever veneer slicers or rotary veneer-cutting machines have been shutdown for the purpose of inserting logs or to make adjustments, operators make sure that the machine is clear and other workmen are not in a hazardous position before starting the machine.</p> <p>Verify that operators do not ride the carriage of a veneer slicer.</p>

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<p><b>ABRASIVE WHEEL MACHINERY</b></p> <p><b>MG.30</b> <b>General Requirements</b></p> <p><b>MG.30.1.</b> Abrasive wheels must be used only on machines provided with safety guards in certain circumstances (29 CFR 1910.215(a)(1)).</p> <p><b>MG.30.2.</b> Guards must be designed so as to satisfy certain requirements (29 CFR 1910.215(a)(2)).</p> <p><b>MG.30.3.</b> Work rests must satisfy certain requirements (29 CFR 1910.215(a)(4)).</p>	<p>(NOTE: Natural sandstone wheels and metal, wooden, cloth, or paper discs having a layer of abrasive on the surface are not covered by 29 CFR 1910.215 (see the checklist items in MG.30 through MG.60).)</p> <p>Verify that abrasive wheels are only used on machines provided with safety guards as defined in 29 CFR 1910.215 (see the checklist items in MG.60).</p> <p>(NOTE: This requirement does not apply to:</p> <ul style="list-style-type: none"> <li>- wheels used for internal work while within the work being ground</li> <li>- mounted wheels, used in portable operations, 2 in. and smaller in diameter</li> <li>- Types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where the work offers protection.)</li> </ul> <p>Verify that the safety guard covers the spindle end, nut, and flange projections.</p> <p>Verify that the safety guard is mounted so as to maintain proper alignment with the wheel.</p> <p>Verify that the strength of the fastenings exceeds the strength of the guard.</p> <p>(NOTE: Safety guards, on all operations where the work provides a suitable measure of protection to the operator, may be so constructed that the spindle end, nut, and outer flange are exposed.)</p> <p>(NOTE: The side covers of the guard may be omitted where the nature of the work is such as to entirely cover the side of the wheel.)</p> <p>(NOTE: The spindle end, nut, and outer flange may be exposed on machines designed as portable saws.)</p> <p>Verify that work rests are used to support the work on offhand grinding machines.</p> <p>Verify that these work rests are of rigid construction and designed to be adjustable to compensate for wheel wear.</p> <p>Verify that work rests are kept adjusted closely to the wheel with a maximum opening of 1/8 in. to prevent the work from being jammed between the wheel and the rest, which may cause breakage.</p>

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	Verify that the work rest is securely clamped after each adjustment.  Verify that adjustments are not made with the wheel in motion.

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<p><b>ABRASIVE WHEEL MACHINERY</b></p> <p><b>MG.40</b>  <b>Guarding of Abrasive Wheel Machinery</b></p> <p><b>MG.40.1.</b> Cup wheels must be guarded in accordance with certain requirements (29 CFR 1910.215(b)(1)).</p> <p><b>MG.40.2.</b> Bench and floor stand grinders must satisfy certain guard exposure angle requirements (29 CFR 1910.215(b)(3) and 1910.215(b)(9)).</p>	<p>(NOTE: Visors or other accessory equipment is not to be included as part of the guard when measuring the guard opening, unless such equipment has strength equal to that of the guard.)</p> <p>Verify that cup wheels (Types 6 and 11) are protected by:</p> <ul style="list-style-type: none"> <li>- safety guards and band type guards as specified in 29 CFR 1910.215(b)(1) through 1910.215(b)(11) (see the checklist items in MG.40) and</li> <li>- special Revolving Cup Guards which mount behind the wheel and turn with it.</li> </ul> <p>Verify that these Revolving Cup Guards are made of steel or other material with adequate strength.</p> <p>Verify that these Revolving Cup Guards enclose the wheel sides upward from the back for one-third of the wheel thickness.</p> <p>Verify that the mounting features of these Revolving Cup Guards conform to all requirements of 29 CFR 1910.215 (see the checklist items in MG.30 through MG.60).</p> <p>Verify that a clearance not exceeding 1/16 in. is maintained between the wheel side and the "Revolving Cup Guard".</p> <p>Verify that the angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands does not exceed 90 degrees or one-fourth of the periphery.</p> <p>Verify that this exposure begins at a point not more than 65 degrees above the horizontal plane of the wheel spindle. (See 29 CFR 1910.215, Figures O-6 and O-7).</p> <p>Verify that the exposure does not exceed 125 degrees, wherever the nature of the work requires contact with the wheel below the horizontal plane of the spindle. (See 29 CFR 1910.215, Figures O-8 and O-9.)</p> <p>Verify that these safety guards, where the operator stands in front of the opening, are constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel.</p> <p>Verify that the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top never exceeds 1/4 in. (See 29 CFR</p>

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<p><b>MG.40.3.</b> Cylindrical grinders must satisfy certain guard exposure angle requirements (29 CFR 1910.215(b)(4) and 1910.215(b)(9)).</p>	<p>1910.215, Figures O-18, O-19, O-20, O-21, and O-23.)</p> <p>Verify that the maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines does not exceed 180 degrees.</p> <p>Verify that this exposure begins at a point not more than 65 degrees above the horizontal plane of the wheel spindle. (See 29 CFR 1910.215, Figures O-10 and O-11).</p> <p>Verify that these safety guards, where the operator stands in front of the opening, are constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel.</p> <p>Verify that the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top never exceeds 1/4 in. (See 29 CFR 1910.215, Figures O-18, O-19, O-20, O-21, and O-23.)</p> <p><b>MG.40.4.</b> Surface grinders and cutting-off machines must satisfy certain guard exposure angle requirements (29 CFR 1910.215(b)(5)).</p> <p>Verify that the maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cutting-off machines and on surface grinding machines which employ the wheel periphery does not exceed 150 degrees.</p> <p>Verify that this exposure begins at a point not less than 15 degrees below the horizontal plane of the wheel spindle. (See 29 CFR 1910.215, Figures O-12 and O-13.)</p> <p><b>MG.40.5.</b> Swing frame grinders must satisfy certain guard exposure angle requirements (29 CFR 1910.215(b)(6)).</p> <p>Verify that the maximum angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as swing frame grinding machines does not exceed 180 degrees.</p> <p>Verify that the top half of the wheel is enclosed at all times. (See 29 CFR 1910.215, Figures O-14 and O-15.)</p> <p><b>MG.40.6.</b> Automatic snagging machines must satisfy certain guard exposure angle requirements (29 CFR 1910.215(b)(7)).</p> <p>Verify that the maximum angular exposure of the grinding wheel periphery and sides for safety guards used on grinders known as automatic snagging machines does not exceed 180 degrees.</p> <p>Verify that the top half of the wheel is enclosed at all times. (See 29 CFR 1910.215, Figures O-14 and O-15.)</p> <p><b>MG.40.7.</b> Exposure due to top grinding must satisfy certain requirements (29 CFR 1910.215(b)(8)).</p> <p>Verify that, where the work is applied to the wheel above the horizontal centerline, the exposure of the grinding wheel periphery is as small as possible and does not exceed 60 degrees. (See 29 CFR 1910.215, Figures O-16 and O-17.)</p>

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<p><b>MG.40.8.</b> Material requirements and minimum dimensions must satisfy certain requirements (29 CFR 1910.215(b)(10)).</p>	<p>(NOTE: See Appendix 49-1 and 29 CFR 1910.215, Figures O-36 and O-37 for minimum basic thickness of peripheral and side members for various types of safety guards and classes of service.)</p> <p>Verify that one of the following safety guards (as specified in Appendix 49-1 and 29 CFR 1910.215, Figures O-36 and O-37) is used if operating speed does not exceed 8000 s.f.p.m.:</p> <ul style="list-style-type: none"> <li>- cast iron safety guards</li> <li>- malleable iron guards</li> <li>- cast steel guards or</li> <li>- structural steel guards.</li> </ul> <p>Verify that cast steel, or structural steel, safety guards as specified in Appendix 49-1 and 29 CFR 1910.215, Figures O-36 and O-37 are used where operating speeds of wheels are faster than 8000 s.f.p.m. up to a maximum 16,000 s.f.p.m.</p> <p>Verify that, for cutting-off wheels 16 in. diameter and smaller and where speed does not exceed 16,000 s.f.p.m., cast iron or malleable iron safety guards as specified in Appendix 49-1 and 29 CFR 1910.215, Figures O-36 and O-37 are used.</p> <p>Verify that, for cutting-off wheels larger than 16 in. diameter and where speed does not exceed 14,200 s.f.p.m., safety guards as specified in Appendix 49-2 and 29 CFR 1910.215, Figures O-27 and O-28 are used.</p> <p>Verify that, for thread grinding wheels not exceeding 1 in. in thickness, cast iron or malleable iron safety guards as specified in Appendix 49-1 and Figures O-36 and O-37 are used.</p>
<p><b>MG.40.9.</b> Band type guards must conform to certain general specifications (29 CFR 1910.215(b)(11)).</p>	<p>Verify that the bands of band type guards are of steel plate or other material of equal or greater strength.</p> <p>Verify that the bands are continuous.</p> <p>Verify that the ends of the bands are either riveted, bolted, or welded together in such a manner as to leave the inside free from projections.</p> <p>Verify that the inside diameter of the band is not more than 1 in. larger than the outside diameter of the wheel.</p> <p>Verify that this inside band is mounted as nearly concentric with the wheel as practicable.</p>

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	<p>Verify that the band is of sufficient width.</p> <p>Verify that the band position is kept so adjusted that at no time will the wheel protrude beyond the edge of the band a distance greater than the smaller of the follow-ing:</p> <ul style="list-style-type: none"> <li>- the distance indicated in Appendix 49-3 and 29 CFR 1910.215, Figure O-29 or</li> <li>- the wall thickness (W).</li> </ul> <p>(NOTE: See 29 CFR 1910.215, Table O-3 for further guidance for the construc-tion of band type guards.)</p>

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<b>ABRASIVE WHEEL MACHINERY</b>  <b>MG.50</b> <b>Flanges</b>  <b>MG.50.1.</b> Flanges for abrasive wheels must satisfy certain general requirements (29 CFR 1910.215(c)(1)).	<p>Verify that all abrasive wheels are mounted between flanges which are not less than one-third of the diameter of the wheel.</p> <p>(NOTE: This requirement does not apply to:</p> <ul style="list-style-type: none"> <li>- mounted wheels</li> <li>- portable wheels with threaded inserts or projecting studs</li> <li>- abrasive discs (inserted nut, inserted washer and projecting stud type)</li> <li>- plate mounted wheels</li> <li>- cylinders, cup, or segmental wheels that are mounted in chucks</li> <li>- Types 27 and 28 wheels</li> <li>- modified types 6 and 11 wheels (terrazzo)</li> <li>- cutting-off wheels, Types 1 and 27A.)</li> </ul> <p>Verify that Type 1 cutting-off wheels are mounted between properly relieved flanges which have matching bearing surfaces.</p> <p>Verify that such flanges are at least one-fourth the wheel diameter.</p> <p>Verify that Type 27A cutting-off wheels are designed to be mounted by means of flat, not relieved, flanges having matching bearing surfaces. (See 29 CFR 1910.215, Figure O-24 for one such type of mounting.)</p> <p>Verify that Type 27A cutting-off wheels are designed to be mounted by means of flat, not relieved, flanges which are less than one-third but not less than one-fourth the wheel diameter.</p> <p>(NOTE: There are three general types of flanges:</p> <ul style="list-style-type: none"> <li>- straight relieved flanges (see 29 CFR 1910.215, Figure O-32)</li> <li>- straight unrelieved flanges (see 29 CFR 1910.215, Figure O-30)</li> <li>- adaptor flanges (see 29 CFR 1910.215, Figure O-33 and O-34).)</li> </ul> <p>Verify that the wheel is always guarded, regardless of flange type used.</p>
<b>MG.50.2.</b> Flanges must satisfy certain finish and balance requirements (29 CFR 1910.215(c)(3)).	<p>Verify that flanges are dimensionally accurate and in good balance.</p> <p>Verify that flanges have no rough surfaces or sharp edges.</p>

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<p><b>MG.50.3.</b> Both flanges between which a wheel is mounted must be uniform under certain circumstances (29 CFR 1910.215(c)(4)).</p>	<p>Verify that both flanges (of any type) between which a wheel is mounted are of the same diameter and have equal bearing surface.</p> <p>(NOTE: This requirement does not apply to modified Types 6 and 11 wheels (terrazzo) with tapered K dimension.)</p> <p>(NOTE: This requirement does not apply to Type 27 and Type 28 wheels, which require specially designed adaptors because of their shape and usage. (See 29 CFR 1910.215, Figure O-24-A.))</p> <p>Verify that the back flange, on Type 27 and Type 28 wheels, extends beyond the central hub or raised portion.</p> <p>Verify that the back flange, on Type 27 and Type 28 wheels, contacts the wheel to counteract the side pressure on the wheel in use.</p> <p>Verify that the adaptor nut, on Type 27 and Type 28 wheels, which is less than the minimum one-third diameter of the wheel fits in the depressed side of the wheel to prevent interference in side grinding and serves to drive the wheel by its clamping force against the depressed portion of the back flange.</p> <p>Verify that only reinforced organic bonded wheels are used for Type 27 and Type 28 wheels.</p> <p>(NOTE: This limitation is because of:</p> <ul style="list-style-type: none"> <li>- the variance in flange diameters</li> <li>- the adaptor nut being less than one-third wheel diameter</li> <li>- the use of side pressure in wheel operation.)</li> </ul> <p>Verify that mounts which are affixed to the Type 27 and Type 28 wheels by the manufacturer are not reused.</p> <p>Verify that Type 27 and Type 28 wheels are used only with a safety guard located between the wheel and the operator during use.</p>
<p><b>MG.50.4.</b> Flange recess and undercut must satisfy certain requirements (29 CFR 1910.215(c)(5)).</p>	<p>Verify that straight relieved flanges made according to Appendix 49-4 and 29 CFR 1910.215, Figure O-32 are recessed at least 1/16 in. on the side next to the wheel for a distance as specified in Appendix 49-4.</p> <p>Verify that straight flanges of the adaptor or sleeve type (Appendix 49-5 and 29 CFR 1910.215, Figures O-33 and O-34) are undercut so that there will be no bearing on the sides of the wheel within 1/8 in. of the arbor hole.</p>
<p><b>MG.50.5.</b> Driving flanges must satisfy certain requirements (29 CFR</p>	<p>Verify that the driving flange is securely fastened to the spindle.</p> <p>Verify that the bearing surface runs true.</p>

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<p>1910.215(c)(7)).</p> <p><b>MG.50.6.</b> Flange dimensions must satisfy certain requirements (29 CFR 1910.215(c)(8)).</p> <p><b>MG.50.7.</b> Repairs and maintenance of flanges must comply with certain requirements (29 CFR 1910.215(c)(9)).</p>	<p>Verify that, when more than one wheel is mounted between a single set of flanges, wheels are either:</p> <ul style="list-style-type: none"> <li>- cemented together or</li> <li>- separated by specially designed spacers.</li> </ul> <p>Verify that the dimensions of straight relieved and unrelieved flanges for use with wheels with small holes that fit directly on the machine spindle are never less than indicated in Appendices 49-4 and 49-6 and 29 CFR 1910.215, Figures O-30 and O-32.</p> <p>Verify that the dimensions of straight adaptor flanges for use with wheels having holes larger than the spindle are never less than indicated in Appendices 49-5 and 49-7 and 29 CFR 1910.215, Figures O-31, O-33, and O-34.</p> <p>Verify that the dimensions of straight flanges that are an integral part of wheel sleeves (which are frequently used on precision grinding machines), are never less than indicated in Appendix 49-8 and 29 CFR 1910.215, Figure O-35.</p> <p>Verify that all flanges are maintained in good condition.</p> <p>Verify that the bearing surfaces are trued or refaced when they become worn, warped, sprung, or damaged.</p> <p>Verify that, when refacing or truing, care is exercised to make sure that proper relief is maintained as specified in Appendices 49-4 and 49-5 and 29 CFR 1910.215, Figures O-32, O-33, and O-34.</p> <p>Verify that flanges are replaced when they do not have the required undercut or do not conform to the requirements the following figures from 29 CFR 1910.215 and appendices:</p> <ul style="list-style-type: none"> <li>- Appendix 49-4</li> <li>- Appendix 49-5</li> <li>- Appendix 49-6</li> <li>- Appendix 49-7</li> <li>- Appendix 49-8</li> <li>- Figures O-30, O-31, O-32, O-33, O-34.</li> </ul> <p>(NOTE: Failure to observe this requirement might cause excessive flange pressure around the hole of the wheel. This is especially true of wheel-sleeve or adaptor flanges.)</p>



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<p><b>ABRASIVE WHEEL MACHINERY</b></p> <p><b>MG.60 Mounting</b></p> <p><b>MG.60.1.</b> Inspections of wheels must satisfy certain requirements (29 CFR 1910.215(d)(1)).</p> <p><b>MG.60.2.</b> Arbor sizes must conform to certain requirements (29 CFR 1910.215(d)(2)).</p>	<p>(NOTE: 29 CFR 1910.215(d) (see the checklist items in MG.60) applies to all abrasive wheels, including cutting-off wheels.)</p> <p>Verify that, immediately before mounting, all wheels are closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise.</p> <p>Verify that the spindle speed of the machine is checked before mounting the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.</p> <p>Verify that wheels which sound cracked (dead) during the "ring test" are not used.</p> <p>(NOTE: The "Ring Test" is performed by tapping gently with a light nonmetallic implement (such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels.)</p> <p>Verify that wheels are dry and free from sawdust when applying the ring test.</p> <p>(NOTE: Organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.)</p> <p>Verify that the wheels are tapped about 45 degrees each side of the vertical centerline and about 1 or 2 in. from the periphery as indicated by the spots in 29 CFR 1910.215, Figure O-25 and O-26.</p> <p>Verify that the wheel is then rotated 45 degrees and that the test is repeated.</p> <p>(NOTE: A sound and undamaged wheel will give a clear metallic tone. If cracked, there will be a dead sound and not a clear "ring".)</p> <p>Verify that grinding wheels fit freely on the spindle and remain free under all grinding conditions.</p> <p>(NOTE: A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion.)</p> <p>Verify that, to accomplish this controlled clearance:</p> <ul style="list-style-type: none"> <li>- the machine spindle is made to nominal (standard) size plus zero, minus</li> </ul>

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<p><b>MG.60.3.</b> All contact surfaces of wheels, blotters and flanges must be flat and free of foreign matter (29 CFR 1910.215(d)(3)).</p> <p><b>MG.60.4.</b> Bushings must not exceed the width of the wheel and must not contact the flanges (29 CFR 1910.215(d)(4)).</p> <p><b>MG.60.5.</b> Blotters are required under certain circumstances (29 CFR 1910.215(c)(6) and 1910.215(d)(5)).</p>	<p>0.002 in.</p> <ul style="list-style-type: none"> <li>- the wheel hole is made suitably oversize to ensure safety clearance under the conditions of operating heat and pressure.</li> </ul> <p>Verify that all contact surfaces of wheels, blotters and flanges are flat and free of foreign matter.</p> <p>Verify that, when a bushing is used in the wheel hole, it:</p> <ul style="list-style-type: none"> <li>- does not exceed the width of the wheel</li> <li>- does not contact the flanges.</li> </ul> <p>Verify that blotters (compressible washers) are used between flanges and abrasive wheel surfaces to ensure uniform distribution of flange pressure.</p> <p>(NOTE: Blotters need not be used with the following types of wheels:</p> <ul style="list-style-type: none"> <li>- mounted wheels</li> <li>- abrasive discs (inserted nut, inserted washer, and projecting-stud type)</li> <li>- plate mounted wheels</li> <li>- cylinders, cups, or segmental wheels that are mounted in chucks</li> <li>- Types 27 and 28 wheels</li> <li>- certain Type 1 and Type 27A cutting-off wheels</li> <li>- certain internal wheels</li> <li>- Type 4 tapered wheels</li> <li>- diamond wheels, except certain vitrified diamond wheels.)</li> </ul> <p>Verify that blotters are applied to the flat side of the wheel only on modified Types 6 and 11 wheels (terrazzo).</p> <p>Verify that, when blotters or flange facings of compressible material are required, they cover the entire contact area of wheel flanges.</p>

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<p><b>MG.60.6.</b> Multiple wheel mounting must satisfy certain requirements (29 CFR 1910.215(d)(6)).</p>	<p>Verify that, when more than one wheel is mounted between a single set of flanges, wheels are either:</p> <ul style="list-style-type: none"> <li>- cemented together or</li> <li>- separated by specially designed spacers.</li> </ul> <p>Verify that spacers are equal in diameter to the mounting flanges and have equal bearing surfaces.</p> <p>Verify that, when mounting wheels which have not been cemented together or ones which do not utilize separating spacers, care is exercised to use wheels specially manufactured for that purpose.</p>



## Appendix 49-1

See 29 CFR 1910.215, Table O-9.



## **Appendix 49-2**

See 29 CFR 1910.215, Table O-1.



**Appendix 49-3**

**Exposure Versus Wheel Thickness**  
(29 CFR 1910.215, Table O-2)

Overall thickness of wheel (T) (inches)	Maximum exposure of wheel (C) (inches)
1/2	1/4
1	1/2
2	3/4
3	1
4	1 1/2
5 and over	2



# Appendix 49-4

**Minimum Dimensions for Straight Relieved Flanges<sup>1</sup> (in inches)**  
(29 CFR 1910.215, Table O-6)

A - Diameter of wheel	B - Minimum Outside diameter of flanges	C - Radial width of bearing surface		D - Minimum thickness of flange at bore	E - Minimum thickness of flange at edge of recess
		Minimum	Maximum		
1	3/8	1/16	1/8	1/16	1/16
2	3/4	1/8	3/16	1/8	3/32
3	1	1/8	3/16	3/16	3/32
4	1 3/8	1/8	3/16	3/16	1/8
5	1 3/4	3/16	1/4	1/4	1/8
6	2	1/4	1/2	3/8	3/16
7	2 1/2	1/4	1/2	3/8	3/16
8	3	1/4	1/2	3/8	3/16
10	3 1/2	5/16	5/8	3/8	1/4
12	4	5/16	5/8	1/2	5/16
14	4 1/2	3/8	3/4	1/2	5/16
16	5 1/2	1/2	1	1/2	5/16
18	6	1/2	1	5/8	3/8
20	7	5/8	1 1/4	5/8	3/8
22	7 1/2	5/8	1 1/4	5/8	7/16
24	8	3/4	1 1/4	5/8	7/16
26	8 1/2	3/4	1 1/4	5/8	1/2
28	10	7/8	1 1/2	3/4	1/2
30	10	7/8	1 1/2	3/4	5/8
36	12	1	2	7/8	3/4
42	14	1	2	7/8	3/4
48	16	1 1/4	2	1 1/8	1
60	20	1 1/4	2	1 1/4	1 1/8
72	24	1 1/2	2 1/2	1 3/8	1 1/4

<sup>1</sup>Flanges for wheels under 2 in. diameter may be unrelieved and shall be maintained flat and true.



## Appendix 49-5

### Minimum Dimensions for Straight Flanges -- For Mechanical Grinders 12,500 S.F.P.M. to 16,500 S.F.P.M.<sup>1</sup> (in inches) (29 CFR 1910.215, Table O-7)

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F <sup>2</sup> -- (D-E) minimum thickness
20	6	8	1	1/2	1/2
20	8	10	1 1/2	3/4	3/4
24	12	15	2	1	1
30	12	15	2	1	1
36	12	15	2	1	1

<sup>1</sup> Flanges shall be of steel, quality SAE 1040 or equivalent, annealed plate, heat treated to R. 25-30.

<sup>2</sup> For wheels under 1-1/4-in. thick, F dimension shall not exceed 40 percent of wheel thickness.



## Appendix 49-6

### Minimum Dimensions for Straight Unrelieved Flanges for Wheels with Threaded Inserts or Projecting Studs (in inches) (29 CFR 1910.215, Table O-4)

A Diameter of wheel	B <sup>1</sup> Minimum outside di- ameter of flange	T Minimum thickness of flange
1	5/8	1/8
2	1	1/8
3	1	3/16
4	1 3/8	3/16
5	1 3/4	1/4
6	2	3/8

<sup>1</sup> NOTE: Must be large enough to extend beyond the bushing. Where prong anchor or cupback bushing are used, this footnote does not apply.



# Appendix 49-7

## Minimum Dimensions for Straight Adaptor Flange -- for Organic Bonded Wheels Over 1-1/4-Inches Thick<sup>1</sup> (in inches) (29 CFR 1910.215, Table O-5)

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F <sup>1</sup> -- (D-E) minimum thickness
12 to 14	4	6	7/8	3/8	1/2
	5	7	7/8	3/8	1/2
	6	8	7/8	3/8	1/2
Larger than 14 to 18	4	6	7/8	3/8	1/2
	5	7	7/8	3/8	1/2
	6	8	7/8	3/8	1/2
	7	9	7/8	3/8	1/2
	8	10	7/8	3/8	1/2
Larger than 18 to 24	6	8	1	1/2	1/2
	7	9	1	1/2	1/2
	8	10	1	1/2	1/2
	10	12	1	1/2	1/2
	12	14	1	1/2	1/2
Larger than 24 to 30	12	15	1	1/2	1/2
Larger than 30 to 36	12	15	1 3/8	7/8	1/2

<sup>1</sup>For wheels under 1-1/4-in. thick, F dimension shall not exceed 40 percent of wheel thickness.



# Appendix 49-8

## Minimum Dimensions for Straight Flanges Used as Wheel Sleeves for Precision Grinding Only (in inches) (29 CFR 1910.215, Table O-8)

Wheel diameter	Wheel hole diameter	B Minimum outside diameter of flange	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut
12 to 14	5	7	1/2	7/16
Larger than 14 to 20	5	7	5/8	7/16
	6	8	5/8	7/16
	8	10	5/8	7/16
	10	11 1/2	5/8	7/16
	12	13 1/2	5/8	7/16
Larger than 20 to 30	8	10	3/4	1/2
	10	11 1/2	3/4	1/2
	12	13 1/2	3/4	1/2
	16	17 1/2	3/4	1/2
Larger than 30 to 42	12	13 1/2	3/4	1/2
	16	17 1/2	3/4	1/2
	18	19 1/2	3/4	1/2
	20	21 1/2	3/4	1/2
Larger than 42 to 60	16	20	1	3/4
	20	24	1	3/4
	24	29	1 1/8	7/8

NOTE: These flanges may be clamped together by means of a central nut, or by a series of bolts or some other equivalent means of fastening.



## **CHAPTER 50**

### **HAND AND PORTABLE POWERED TOOLS AND OTHER HAND-HELD EQUIPMENT**

## CHAPTER 50

### SAFETY: HAND AND PORTABLE POWERED TOOLS AND OTHER HAND-HELD EQUIPMENT

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#### Compliance Definitions

- *Explosive Powerload* - (an explosive-actuated fastening tool term) any substance in any form capable of producing a propellant force (29 CFR 1910.241(a)(6)).
- *Fastener* - See *Stud* (29 CFR 1910.241(a)(4)).
- *Hammer-Operated Piston Tool* - (an explosive-actuated fastening tool term) a tool which, by means of a heavy mass hammer supplemented by a load, moves a piston designed to be captive to drive a stud, pin, or fastener into a work surface. It must be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin, or fastener to have a mean velocity in excess of 300 ft/second when measured 6.5 ft from the muzzle end of the barrel (29 CFR 1910.241(a)(1)).
- *High Velocity Tool* - (an explosive-actuated fastening tool term) a tool or machine which, when used with a load, propels or discharges a stud, pin, or fastener, at velocities in excess of 300 ft/second when measured 6.5 ft from the muzzle end of the barrel, for the purpose of impinging it upon, affixing it to, or penetrating another object or material (29 CFR 1910.241(a)(2)).
- *Jack* - an appliance for lifting and lowering or moving horizontally a load by application of a pushing force. Jacks may be of the lever and ratchet, screw, or hydraulic type (29 CFR 1910.241(d)(1)).
- *Jack Rating* - the maximum working load for which the *jack* is designed to lift safely that load throughout its specified amount of travel (29 CFR 1910.241(d)(2)).  
  
(NOTE: To raise the rated load, the point of application of the load, the applied force, and the length of lever arm should be those designated by the manufacturer for the particular jack considered.)
- *Load* - see *Explosive Power Load* (29 CFR 1910.241(a)(6)).
- *Low-Velocity Piston Tool* - (an explosive-actuated fastening tool term) a tool that utilizes a piston designed to drive a stud, pin, or fastener into a work surface. It must be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin, or fastener to have a mean velocity in excess of 300 ft/ second when measured 6.5 ft from the muzzle end of the barrel (29 CFR 1910.241(a)(3)).
- *Mounted Wheels* - (an abrasive wheel term) usually 2-in. diameter or smaller, and of various shapes, may be either organic or inorganic bonded abrasive wheels. They are secured to plain or threaded steel mandrels (29 CFR 1910.241(b)(1)).
- *Organic Bonded Wheels* - (an abrasive wheel term) wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent (29 CFR 1910.241(b)(5)).
- *Pin* - See *Stud* (29 CFR 1910.241(a)(4)).

- *Portable Grinding* - (an abrasive wheel term) a grinding operation where the grinding machine is designed to be hand held and may be easily moved from one location to another (29 CFR 1910.241(b)(4)).
- *Protective Shield or Guard* - (an explosive-actuated fastening tool term) a device or guard attached to the muzzle end of the tool, which is designed to confine flying particles (29 CFR 1910.241(a)(8)).
- *Reinforced Wheels* - (an abrasive wheel term) as applied to grinding wheels, this term defines a class of organic wheels which contain strengthening fabric or filament. The term *reinforced* does not cover wheels using such mechanical additions as steel rings, steel cup backs, or wire or tape winding (29 CFR 1910.241(b)(7)).
- *Stud* - (an explosive-actuated fastening tool term) a fastening device specifically designed and manufactured for use in explosive-actuated fastening tools (29 CFR 1910.241(a)(4)).
- *To Chamber* - (an explosive-actuated fastening tool term) to fit properly without the use of excess force, the case being duly supported (29 CFR 1910.241(a)(5)).
- *Tool* - (an explosive-actuated fastening tool term) an explosive-actuated fastening tool, unless otherwise indicated and all accessories pertaining thereto (29 CFR 1910.241(a)(7)).
- *Tuck Pointing* - (an abrasive wheel term) removal, by grinding of cement, mortar, or other nonmetallic jointing material (29 CFR 1910.241(b)(2)).
- *Tuck Pointing Wheels* - (an abrasive wheel term) usually, *Type 1*, reinforced *organic bonded wheels* with diameter, thickness and hole size dimension. They are subject to the same limitations of use and mounting as *Type 1* wheels. Wheels used for tuck pointing should be reinforced, organic bonded (29 CFR 1910.241(b)(3)).

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**GUIDANCE FOR CHECKLIST USERS**

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	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
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Guarding of Portable Powered Tools		
Portable Powered Tools	HT.20.1 through HT.20.7	50-7
Pneumatic Powered Tools and Hose	HT.30.1	50-11
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Power Lawnmowers	HT.60.1 through HT.60.7	50-23
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<p><b>HT.10 GENERAL REQUIRMENTS</b></p> <p><b>HT.10.1.</b> Compressed air must not be used for cleaning purposes unless specific requirements are met (29 CFR 1910.242(b)).</p>	<p>(NOTE: The installation is responsible for the safe condition of tools and equipment used by personnel, including tools and equipment which may be furnished by personnel.)</p> <p>Verify that compressed air is not used for cleaning purposes, except where reduced to less than 30 psi, and then only with effective chip guarding and PPE.</p>



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<p><b>GUARDING OF PORTABLE POWERED TOOLS</b></p> <p><b>HT.20</b> <b>Portable Powered Tools</b></p> <p><b>HT.20.1.</b> Portable circular saws must be equipped with guards that meet specific requirements (29 CFR 1910.243(a)(1)(i)).</p> <p><b>HT.20.2.</b> Certain portable powered tools must be equipped with a constant pressure switch or control that will shut off the power when the pressure is released (29 CFR 1910.243(a)(2)(i)).</p>	<p>(NOTE: This checklist item does not apply to circular saws used in the meat industry for meat cutting purposes.)</p> <p>Verify that all portable, power-driven circular saws having a blade diameter greater than 2 in. are equipped with guards above and below the base plate or shoe.</p> <p>Verify that the upper guard covers the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts.</p> <p>Verify that the lower guard covers the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work.</p> <p>Verify that, when the tool is withdrawn from the work, the lower guard automatically and instantly returns to covering position.</p> <p>(NOTE: Checklist items HT.20.2 through HT.20.4 do not apply to the following:</p> <ul style="list-style-type: none"> <li>- concrete vibrators</li> <li>- concrete breakers</li> <li>- powered tampers</li> <li>- jack hammers</li> <li>- rock drills</li> <li>- garden appliances</li> <li>- household and kitchen appliances</li> <li>- personal care appliances</li> <li>- medical or dental equipment</li> <li>- fixed machinery.)</li> </ul> <p>Verify that the following are equipped with a constant pressure switch or control that will shut off the power when the pressure is released:</p> <ul style="list-style-type: none"> <li>- hand held powered circular saws having a blade diameter greater than 2 in.</li> <li>- electric chain saws</li> <li>- hydraulic chain saws</li> <li>- pneumatic chain saws</li> <li>- percussion tools without positive accessory holding means.</li> </ul>

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<p><b>HT.20.3.</b> Certain portable powered tools must be equipped with a constant pressure switch or control, but may have a lock-on control (29 CFR 1910.243(a)(2)(ii) and (iii)).</p>	<p>Verify that all hand-held gasoline powered chain saws are equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.</p> <p>(NOTE: These tools may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.)</p> <p>Verify that the following are equipped with a constant pressure switch or control:</p> <ul style="list-style-type: none"> <li>- all hand-held power drills</li> <li>- tapers</li> <li>- fastener drivers</li> <li>- horizontal grinders with wheels greater than 2 in. in diameter</li> <li>- vertical grinders with wheels greater than 2 in. in diameter</li> <li>- angle grinders with wheels greater than 2 in. in diameter</li> <li>- disc sanders with discs greater than 2 in. in diameter</li> <li>- belt sanders</li> <li>- reciprocating saws</li> <li>- saber saws with blade shanks greater than a nominal 1/2 in.</li> <li>- scroll saws with blade shanks greater than a nominal 1/2 in.</li> <li>- jig saws with blade shanks greater than a nominal 1/2 in.</li> <li>- other similarly operating powered tools.</li> </ul> <p>(NOTE: All other hand-held powered tools, including but not limited to the following, may have either a positive "on-off" control, or other controls as described by checklist item HT.20.2 and this checklist item:</p> <ul style="list-style-type: none"> <li>- platen sanders</li> <li>- grinders with wheels 2 in. in diameter or less</li> <li>- disc sanders with discs 2 in. in diameter or less</li> <li>- routers</li> <li>- planers</li> <li>- laminate trimmers</li> <li>- nibblers</li> <li>- shears</li> <li>- saber saws with blade shanks a nominal 1/4 in. wide or less</li> <li>- scroll saws with blade shanks a nominal 1/4 in. wide or less</li> <li>- jig saws with blade shanks a nominal 1/4 in. wide or less.)</li> </ul> <p>(NOTE: "Nominal" in this checklist item means plus/minus 0.05 in.)</p> <p>(NOTE: Saber, scroll, and jig saws with nonstandard blade holders may use blades with shanks which are nonuniform in width, provided the narrowest portion of the blade shank is an integral part in mounting the blade, and the blade shank width is measured at the narrowest portion of the blade shank.)</p>

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<b>HT.20.4.</b> The operating control on hand-held tools must be so located as to minimize the possibility of its accidental operation (29 CFR 1910.243(a)(2)(iv)).	Verify that the operating control on hand-held tools is so located as to minimize the possibility of its accidental operation, if such accidental operation would constitute a hazard to personnel.
<b>HT.20.5.</b> Portable sanding machines must meet certain requirements (29 CFR 1910.243(a)(3)).	<p>Verify that belt sanding machines are provided with guards at each nip point where the sanding belt runs onto a pulley.</p> <p>Verify that these guards effectively prevent the hands or fingers of the operator from coming in contact with the nip points.</p> <p>Verify that the unused run of the sanding belt is guarded against accidental contact.</p>
<b>HT.20.6.</b> Cracked saws must be removed from service (29 CFR 1910.243(a)(4)).	Verify that all cracked saws are removed from service.
<b>HT.20.7.</b> Portable electric powered tools must meet all general electrical requirements (29 CFR 1910.243(a)(5)).	Verify that portable electric powered tools meet the electrical requirements of 29 CFR 1910, Subpart S -- Electrical.



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<p><b>GUARDING OF PORTABLE POWERED TOOLS</b></p> <p><b>HT.30</b> <b>Pneumatic Powered Tools and Hose</b></p> <p><b>HT.30.1.</b> Pneumatic powered tools and hoses must meet certain requirements (29 CFR 1910.243(b)(1) and 1910.243(b)(2)).</p>	<p>Verify that, for pneumatic powered tools, a tool retainer is installed on each piece of utilization equipment which, without such a retainer, may eject the tool.</p> <p>Verify that hose and hose connections used for conducting compressed air to utilization equipment is designed for the pressure and service to which they are subjected.</p>



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<p><b>GUARDING OF PORTABLE POWERED TOOLS</b></p> <p><b>HT.40</b> <b>Portable Abrasive Wheels</b></p> <p><b>HT.40.1.</b> Abrasive wheels must be used only on machines provided with safety guards (29 CFR 1910.243(c)(1)).</p> <p><b>HT.40.2.</b> A safety guard must cover the spindle end, nut, and flange projections (29 CFR 1910.243(c)(1)(ii)(a)).</p> <p><b>HT.40.3.</b> The safety guard on portable abrasive wheels must be mounted and fastened in accordance with certain requirements (29 CFR 1910.243(c)(1)(ii)(a)).</p> <p><b>HT.40.4.</b> Type 6 and 11 cup wheels must be protected by certain types of guards (29 CFR 1910.243(c)(2)(i) through 1910.243(c)(2)(iii)).</p>	<p>(NOTE: 29 CFR 1910.243(c) (see the checklist items in HT.40) does not cover natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface.)</p> <p>Verify that abrasive wheels are used only on machines provided with safety guards as defined in 29 CFR 1910.243(c)(1) through (4) (see checklist items HT.40.1 through HT.40.7).</p> <p>(NOTE: The following classes of wheels and conditions are exceptions to this requirement:</p> <ul style="list-style-type: none"> <li>- wheels used for internal work while within the work being ground</li> <li>- mounted wheels used in portable operations 2 in. and smaller in diameter (see definitions, <i>Mounted Wheels</i>)</li> <li>- Types 16, 17, 18, 18R, and 19 cones, and plugs, and threaded hole pot balls where the work offers protection.)</li> </ul> <p>Verify that a safety guard covers the spindle end, nut, and flange projections.</p> <p>(NOTE: Safety guards on all operations where the work provides a suitable measure of protection to the operator may be so constructed that the spindle end, nut and outer flange are exposed. Where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted.)</p> <p>(NOTE: The spindle end, nut, and outer flange may be exposed on portable machines designed for, and used with, Type 6, 11, 27 and 28 abrasive wheels, cutting off wheels, and tuck painting wheels.)</p> <p>Verify that the safety guard is mounted so as to maintain proper alignment with the wheel.</p> <p>Verify that the strength of the fastenings exceeds the strength of the guard.</p> <p>Verify that Type 6 and 11 cup wheels are protected by one of the following:</p> <ul style="list-style-type: none"> <li>- safety guards</li> <li>- special revolving cup guards which mount behind the wheel and turn with it</li> <li>- some other form of guard that will ensure an equivalent level of protection.</li> </ul>

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<p><b>HT.40.5.</b> Revolving cup guards used to protect cup wheels must meet certain requirements (29 CFR 1910.243(c)(2)(ii)).</p>	<p>Verify that revolving cup guards, if used to protect cup wheels, are made of steel or other material with adequate strength.</p> <p>Verify that revolving cup guards enclose the wheel sides upward from the back for 1/3 of the wheel thickness.</p> <p>Verify that revolving cup guards conform to the mounting requirements of 29 CFR 1910.243(c)(5) (see checklist items HT.40.8 through HT.40.13).</p> <p>Verify that there is clearance between the wheel side and the guard.</p> <p>Verify that the clearance does not exceed 1/16 in.</p>
<p><b>HT.40.6.</b> Safety guards used on vertical portable grinders must meet certain requirements (29 CFR 1910.243(c)(3)).</p>	<p>Verify that safety guards used on machines known as right angle head or vertical portable grinders have a maximum exposure angle of 180 degrees.</p> <p>Verify that the guard is located so as to be between the operator and the wheel during use.</p> <p>Verify that adjustment of the guard is such that pieces of an accidentally broken wheel will be deflected away from the operator.</p> <p>(NOTE: 29 CFR 1910.243, Fig. P-4 illustrates these requirements.)</p>
<p><b>HT.40.7.</b> Other portable grinders must meet certain requirements (29 CFR 1910.243(c)(4)).</p>	<p>Verify that the maximum angular exposure of the grinding wheel periphery and sides for safety guards on other portable grinding machines does not exceed 180 degrees.</p> <p>Verify that the top half of the wheel is enclosed at all times.</p> <p>(NOTE: 29 CFR 1910.243, Figs. P-5 and P-6 illustrate these requirements.)</p> <p>(NOTE: These requirements apply to all portable grinders other than vertical portable grinders.)</p>
<p><b>HT.40.8.</b> Immediately before counting, all wheels must be closely inspected for damage (29 CFR 1910.243(c)(5)(i)).</p>	<p>Verify that, immediately before mounting, all wheels are closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise.</p> <p>(NOTE: Procedures of the ring test are covered in 29 CFR 1910.215(d)(1) (see checklist item MG.60.1).)</p>

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<b>HT.40.9.</b> Before mounting the wheel, the spindle speed of the machine must be checked (29 CFR 1910.243(c)(5)(i)).	Verify that the spindle speed of the machine is checked before the mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.
<b>HT.40.10.</b> Grinding wheels must fit freely on the spindle (29 CFR 1910.243(c)(5)(ii)).	Verify that grinding wheels fit freely on the spindle and remain free under all grinding conditions.
<b>HT.40.11.</b> A controlled clearance must be maintained between the wheel hole and the machine spindle (29 CFR 1910.243(c)(5)(ii)).	Verify that the machine spindle is made to nominal (standard) size plus zero minus .002 in.  Verify that the wheel hole is made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.
<b>HT.40.12.</b> All contact surfaces of wheels, blotters, and flanges must be flat and free of foreign matter (29 CFR 1910.243(c)(5)(iii)).	Verify that all contact surfaces of wheels, blotters, and flanges are flat and free of foreign matter.  (NOTE: See 29 CFR 1910.215(c), (the checklist items in MG.50) for the requirements for the use of flanges and blotters.)
<b>HT.40.13.</b> When a bushing is used in the wheel hole, it must meet certain requirements (29 CFR 1910.243(c)(5)(iv)).	Verify that, when a bushing is used in the wheel hole, it does not exceed the width of the wheel.  Verify that, when a bushing is used in the wheel hole, it does not contact the flanges.



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<p><b>GUARDING OF PORTABLE POWERED TOOLS</b></p> <p><b>HT.50</b> <b>Explosive Actuated Fastening Tools</b></p> <p><b>HT.50.1.</b> Eye, head, and face protection must be used in accordance with certain requirements (29 CFR 1910.243(d)(1)(ii)).</p> <p><b>HT.50.2.</b> High velocity tools must meet specific requirements (29 CFR 1910.243(d)(2)(i)(a) through 1910.243(d)(2)(i)(h)).</p>	<p>Verify that personnel using and assisting in the use of explosive-actuated fastening tools wear eye protection.</p> <p>Verify that head and face protection are used according to the requirements specified in 29 CFR 1910, Subpart I (see the checklist items in SP.10 and SP.20)).</p> <p>Verify that there is a protective shield or guard on the muzzle end of high velocity tools that:</p> <ul style="list-style-type: none"> <li>- has a 3-1/2 in. minimum diameter</li> <li>- is mounted perpendicular to and concentric with the barrel, and</li> <li>- is designed to confine any flying fragments or particles that might otherwise create a hazard at the time of firing.</li> </ul> <p>Verify that where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield, guard fixture, or jig designed and built by the manufacturer of the tool being used, which provides this degree of protection, is used as a substitute.</p> <p>Verify that the tool cannot be fired unless it is equipped with a standard protective shield or guard, or a special shield, guard, fixture, or jig.</p> <p>Verify that the firing mechanism is designed so that the tool cannot fire during loading or preparation to fire, or if the tool is dropped while loaded.</p> <p>Verify that firing of the tool is dependent on at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.</p> <p>Verify that the tool will not operate other than against a work surface.</p> <p>Verify that the tool will not operate unless the operator holds it against the work surface with a force at least 5 lb greater than the total weight of the tool.</p> <p>Verify that the tool will not operate when equipped with the standard guard in-</p>

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<p><b>HT.50.3.</b> Low-velocity piston tools must meet specific requirements (29 CFR 1910.243(d)(2)(ii)(a) through 1910.243(d) (2)(ii)(e)).</p>	<p>dexed to the center position if any bearing surface of the guard is tilted more than 8 degrees from contact with the work surface.</p> <p>Verify that, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force, positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary.</p> <p>Verify that all breeching parts are reasonably visible to allow a check for any foreign matter that may be present.</p> <p>Verify that the muzzle end of the tool is designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel.</p> <p>Verify that a standard spall shield is supplied with each tool.</p> <p>Verify that the tool does not, under ordinary usage, propel or discharge a stud, pin, or fastener while loading or during preparation to fire, or if the tool is dropped while loaded.</p> <p>Verify that firing of the tool is dependent on at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.</p> <p>Verify that the tool will not operate other than against a work surface.</p> <p>Verify that the tool will not operate unless the operator holds it against the work surface with a force at least 5 lb greater than the total weight of the tool.</p> <p>Verify that, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force, positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary.</p> <p>Verify that all breeching parts are reasonably visible to allow a check for any foreign matter that may be present.</p> <p>(NOTE: Any additional safety features may be incorporated into low-velocity-piston tools.)</p>
<p><b>HT.50.4.</b> Low-velocity hammer-operated piston tools must meet specific requirements (29 CFR 1910.243(d)(2)(iii)(a))</p>	<p>Verify that the muzzle end of the tool is designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel.</p>

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<p>through 1910.243(d)(2) (iii)(e)).</p> <p><b>HT.50.5.</b> Loads and fasteners must meet certain requirements (29 CFR 1910.243(d)(3)(i) through 1910.243(d)(3)(iv)).</p> <p><b>HT.50.6.</b> Explosive actuated fastening tools must be inspected before use (29 CFR 1910.243(d)(4)(i)).</p> <p><b>HT.50.7.</b> Defective explosive actuated fastening tools must not be used until properly repaired (29 CFR 1910.243(d)(4)(ii)).</p> <p><b>HT.50.8.</b> All explosive actuated fastening tools must be unloaded when not in use</p>	<p>Verify that a standard spall shield is supplied with each tool.</p> <p>Verify that the tool does not, under ordinary usage, propel or discharge a stud, pin, or fastener while loading or during preparation to fire, or if the tool is dropped while loaded.</p> <p>Verify that firing of the tool is dependent on at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.</p> <p>Verify that, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force, positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary.</p> <p>Verify that all breeching parts are reasonably visible to allow a check for any foreign matter that may be present.</p> <p>Verify that there is a standard means of identifying the power levels of loads used in tools. Verify that no load (cased or caseless) is used if it will both:</p> <ul style="list-style-type: none"> <li>- accurately chamber in any existing approved commercially available low-velocity piston tool or low-velocity hammer operated piston tool</li> <li>- cause a fastener to have a mean velocity in excess of 300 ft/s when measured 6.5 ft. from the muzzle end of the barrel.</li> </ul> <p>Verify that no individual test firing of a series exceeds 300 ft/s by more than 8 percent.</p> <p>Verify that fasteners used in tools are only those specifically manufactured for use in such tools.</p> <p>Verify that, before using any explosive actuated fastening tool, the operator determines that it is clean, all moving parts operate freely, and the barrel is free from obstructions.</p> <p>Verify that a defective explosive actuated fastening tool is not used until it is properly repaired.</p> <p>Verify that explosive actuated fastening tools are not loaded until just prior to the intended firing time.</p>

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<p>(29 CFR 1910.243(d)(4)(iii) and 1910.243(d)(4)(iv)).</p> <p><b>HT.50.9.</b> In the case of explosive actuated fastening tool misfire, certain procedures must be followed (29 CFR 1910.243(d)(4)(v)).</p> <p><b>HT.50.10.</b> An explosive actuated fastening tools must never be unattended where it would be available to unauthorized persons (29 CFR 1910.243(d)(4)(vi)).</p> <p><b>HT.50.11.</b> Fasteners must be driven into materials in accordance with specific requirements (29 CFR 1910.243(d)(4)(vii) through 1910.243(d)(4)(xi)).</p>	<p>Verify that tools are not loaded unless being prepared for immediate use.</p> <p>Verify that unattended tools are not left loaded.</p> <p>Verify that neither loaded nor empty tools are pointed at any workman.</p> <p>Verify that, in the case of misfire, the operator does the following:</p> <ul style="list-style-type: none"> <li>- hold the tool in the operating position for at least 30 s</li> <li>- try to operate the tool a second time</li> <li>- wait another 30 s, holding the tool in the operating position</li> <li>- remove the explosive load in strict accordance with the manufacturer's instructions.</li> </ul> <p>Verify that no explosive actuated fastening tool is left unattended in a place where it would be available to unauthorized persons.</p> <p>Verify that fasteners are not driven into very hard or brittle materials including, but not limited to, the following:</p> <ul style="list-style-type: none"> <li>- cast iron</li> <li>- glazed tile</li> <li>- surface-hardened steel</li> <li>- glass block</li> <li>- live rock</li> <li>- face brick</li> <li>- hollow tile.</li> </ul> <p>Verify that driving into easily penetrated materials is avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying-missile hazard on the other side.</p> <p>Verify that fasteners are not driven into material such as brick or concrete closer than 3 in. from the unsupported edge or corner.</p> <p>Verify that fasteners are not driven into steel surfaces closer than 1/2 in. from the unsupported edge or corner, unless a special guard, fixture, or jig is used.</p> <p>(NOTE: Low-velocity tools may drive no closer than 2 in. from an edge in concrete or 1/4 in. in steel.)</p> <p>(NOTE: When fastening other materials, such as a 2- by 4-in. wood section to a</p>

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<p><b>HT.50.12.</b> Explosive actuated fastening tools must not be used in an explosive or flammable atmosphere (29 CFR 1910.243(d)(4)(xii)).</p> <p><b>HT.50.13.</b> All explosive actuated fastening tools must be used with the correct shield, guard, or attachment recommended by the manufacturer (29 CFR 1910.243(d)(4)(xiii)).</p> <p><b>HT.50.14.</b> Any explosive actuated fastening tool not in proper working order must be removed from service, repaired, and regularly inspected thereafter (29 CFR 1910.243(d)(4)(xiv)).</p>	<p>concrete surface, it is permissible to drive a fastener of not greater than 7/32-in. shank diameter not closer than 2 in. from the unsupported edge or corner of the work surface.)</p> <p>Verify that fasteners are not driven through existing holes unless a positive guide is used to secure accurate alignment.</p> <p>Verify that no fastener is driven into a spalled area caused by an unsatisfactory fastening.</p> <p>Verify that explosive actuated fastening tools are not used in an explosive or flammable atmosphere.</p> <p>Verify that all explosive actuated fastening tools are used with the correct shield, guard, or attachment recommended by the manufacturer.</p> <p>Verify that any explosive actuated fastening tool found not in proper working order is removed from service immediately.</p> <p>Verify that the tool is repaired in accordance with the manufacturer's specifications.</p> <p>Verify that the tool is inspected at regular intervals.</p>



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<p><b>GUARDING OF PORTABLE POWERED TOOLS</b></p> <p><b>HT.60</b> <b>Power Lawnmowers</b></p> <p><b>HT.60.1.</b> Power lawnmowers must meet certain general requirements (29 CFR 1910.243(e)(1)(i) through 1910.243(e)(1)(v)).</p> <p><b>HT.60.2.</b> Walk-behind and riding rotary mower blades must be enclosed (29 CFR 1910.243(e)(2)(i)).</p> <p><b>HT.60.3.</b> Walk-behind rotary mower discharge openings must meet certain requirements (29 CFR 1910.243(e)(3)(i) through 1910.243(e)(3)(ii)(b)).</p>	<p>Verify that, during normal starting, mounting, and operation of the machine, all power-driven chains, belts, and gears are so positioned or otherwise guarded to prevent personnel from accidental contact with them</p> <p>Verify that a shutoff device is provided to stop operation of the motor or engine.</p> <p>Verify that the shutoff device requires manual and intentional reactivation to restart the motor or engine.</p> <p>Verify that all positions of the operating controls are clearly identified.</p> <p>Verify that the following or similar words are clearly visible at an engine starting control point on self-propelled mowers:</p> <p style="text-align: center;">CAUTION. BE SURE THE OPERATING CONTROL(S) IS IN NEUTRAL BEFORE STARTING THE ENGINE.</p> <p>Verify that, for walk-behind and riding rotary mowers, the blades are enclosed except on the bottom.</p> <p>Verify that the blade enclosure extends to or below the lowest cutting point of the blade in the lowest blade position.</p> <p>(NOTE: Mowers with a swingover handle are considered as having no front in the blade enclosure and therefore comply with the requirement of this checklist item.)</p> <p>Verify that the horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, does not contact the operator area.</p> <p>Verify that there is one of the following at all openings in the blade enclosure intended for the discharge of grass:</p> <ul style="list-style-type: none"> <li>- a minimum unobstructed horizontal distance of 3 in. from the end of the discharge chute to the blade tip</li> <li>- a rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools.</li> </ul>

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<p><b>HT.60.4.</b> Riding rotary mower debris openings must meet certain requirements (29 CFR 1910.243(e)(4)(ii) through 1910.243(e)(4)(iii)(b)).</p> <p><b>HT.60.5.</b> Riding rotary mower debris openings must be provided with stops to prevent jackknifing or locking of the steering mechanism (29 CFR 1910.243(e)(4)(iv)).</p> <p><b>HT.60.6.</b> Riding rotary mowers must be provided with stopping means (29 CFR 1910.243(e)(4)(v)).</p> <p><b>HT.60.7.</b> Walk-behind rotary mower drive disengaging controls must include certain design features (29 CFR 1910.243(e)(4)(vi)).</p>	<p>Verify that, if a bar is fastened across the discharge opening, the bottom of the bar is no higher than the bottom edge of the blade enclosure.</p> <p>Verify that opening(s) are placed so that grass or debris will not discharge directly toward personnel seated in normal operator position.</p> <p>Verify that there is one of the following at all openings in the blade enclosure intended for the discharge of grass:</p> <ul style="list-style-type: none"> <li>- a minimum unobstructed horizontal distance of 6 in. from the end of the discharge chute to the blade tip circle</li> <li>- a rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools.</li> </ul> <p>Verify that, if a bar is fastened across the discharge opening, the bottom of the bar is no higher than the bottom edge of the blade enclosure.</p> <p>Verify that mowers are provided with stops to prevent jackknifing or locking of the steering mechanism.</p> <p>Verify that vehicle stopping means are provided.</p> <p>Verify that the mower drive disengaging controls include the following design features:</p> <ul style="list-style-type: none"> <li>- hand-operated wheel drive disengaging controls move in the opposite direction of vehicle motion</li> <li>- foot-operated wheel drive disengaging controls are depressed</li> <li>- deadman controls, both hand and foot operated, automatically interrupt power to a drive when the operator's actuating force is removed.</li> </ul> <p>(NOTE: Deadman controls may operate in any direction to disengage the drive.)</p>

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<p><b>HT.70</b>  <b>OTHER PORTABLE TOOLS AND EQUIPMENT</b></p> <p><b>HT.70.1.</b> Jacks must be appropriately loaded and marked (29 CFR 1910.244(a)(1)(i) and 1910.244(a)(1)(ii)).</p> <p><b>HT.70.2.</b> Jacks must be operated and maintained in accordance with certain requirements (29 CFR 1910.244(a)(2)(i) through 1910.244(a)(2)(viii)).</p>	<p>Verify that the operator ensures that the jack used has a rating sufficient to lift and sustain the load.</p> <p>Verify that the rated load is legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.</p> <p>Verify that, in the absence of a firm foundation, the base of the jack is blocked.</p> <p>Verify that, if there is a possibility of slippage of the cap, a lock will be placed in between the cap and the load.</p> <p>Verify that the operator watches the stop indicator in order to determine the limit of travel.</p> <p>Verify that the limit of travel is not overrun.</p> <p>Verify that the stop indicator is kept clean.</p> <p>Verify that, after the load has been raised, it is cribbed, blocked, or otherwise secured at once.</p> <p>Verify that hydraulic jacks exposed to freezing temperatures are supplied with an adequate antifreeze liquid.</p> <p>Verify that all jacks are properly lubricated at regular intervals.</p> <p>Verify that each jack is thoroughly inspected not less frequently than the following:</p> <ul style="list-style-type: none"> <li>- for constant intermittent use at one locality, once every 6 months</li> <li>- for jacks sent out of shop for special work, when sent out and when returned</li> <li>- for a jack subjected to abnormal load or shock, immediately before and immediately thereafter.</li> </ul> <p>Verify that repair or replacement parts are examined for possible defects.</p> <p>Verify that out of order jacks are tagged accordingly and not used until repaired.</p>

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<b>HT.70.3.</b> Abrasive blast cleaning nozzles must meet certain requirements (29 CFR 1910.244(b)).	Verify that the blast cleaning nozzles are equipped with an operating valve which must be held open manually.  Verify that a support is provided on which the nozzle may be mounted when it is not in use.

**CHAPTER 51**  
**WELDING, CUTTING, AND BRAZING**

## CHAPTER 51

### SAFETY: WELDING, CUTTING, AND BRAZING

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#### Compliance Definitions

(NOTE: All welding terms not defined in this chapter are used in accordance with American Welding Society--Terms and Definitions--A3.0--969.)

- *Approved* - regarding welding, cutting, and brazing; approved means, unless otherwise indicated, listed or approved equipment by a nationally recognized testing laboratory. Refer to 29 CFR 1910.155(c)(3)(iv)(A) for definition of listed, and to 29 CFR 1910.7 for nationally recognized testing laboratory (29 CFR 1910.251(b)).
- *Confined Space* - regarding welding, cutting, or brazing, confined space means a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship (29 CFR 1910.252(b)(4)(i)).
- *Welder and Welding Operator* - any operator of electric or gas welding and cutting equipment (29 CFR 1910.251(a)).



## **SAFETY: WELDING, CUTTING, AND BRAZING**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
General Requirements		
Fire Prevention and Protection	WL.10.1 through WL.10.23	51-5
Protection of Personnel	WL.20.1 through WL.20.12	51-11
Health Protection and Ventilation	WL.30.1 through WL.30.19	51-15
Industrial Applications	WL.40.1 through WL.40.5	51-21
Oxygen-Fuel Gas Welding and Cutting	WL.50.1 through WL.50.45	51-23
Arc Welding and Cutting	WL.60.1 through WL.60.20	51-37
Resistance Welding		
General Requirements	WL.70.1 through WL.70.4	51-43
Spot and Seam Welding Machines (Nonportable)	WL.80.1 through WL.80.9	51-45
Portable Welding Machines	WL.90.1 through WL.90.6	51-47
Flash Welding Equipment	WL.100.1 through WL.100.3	51-49
Maintenance	WL.110.1 through WL.110.	51-51



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<p><b>GENERAL REQUIREMENTS</b></p> <p><b>WL.10</b>  <b>Fire Prevention and Protection</b></p> <p><b>WL.10.1.</b> If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity must be taken to a safe place (29 CFR 1910.252(a)(1)(i)).</p> <p><b>WL.10.2.</b> Guards must be used in certain circumstances to confine the heat, sparks, and slag, and to protect the immovable fire hazards (29 CFR 1910.252(a)(1)(ii)).</p> <p><b>WL.10.3.</b> Welding and cutting may not be performed if the requirements of 29 CFR 1910.252(a)(1)(i) and 29 CFR 1910.252(a)(1)(ii) cannot be met (29 CFR 1910.252(a)(1)(iii)).</p> <p><b>WL.10.4.</b> If the nature of the work requires the use of guards, additional precautions must be taken (29 CFR 1910.252(a)(2)(i) and 29 CFR 1910.252(a)(2)(ii)).</p>	<p>(NOTE: For elaboration of these basic precautions and of the special precautions also incorporated into this chapter, as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors (including outside contractors) and those in management on whose property cutting and welding is to be performed, see Standard for Fire Prevention in Use of Cutting and Welding Processes, National Fire Protection Association (NFPA) Standard 51B, 1962.)</p> <p>Verify that all movable fire hazards in the vicinity are taken to a safe place in the event that the object to be welded or cut cannot itself be readily moved.</p> <p>Verify that guards are used to confine the heat, sparks, and slag, and to protect the immovable fire hazards in the event that the object to be welded or cut cannot itself be moved and if all the fire hazards cannot be removed.</p> <p>(NOTE: See 29 CFR 1910.252(a)(2) (checklist items WL.10.4 through WL.10.18) for further requirements.)</p> <p>Verify that no welding or cutting is performed unless the requirements of 29 CFR 1910.252(a)(1)(i) and 29 CFR 1910.252(a)(1)(ii) are met (see checklist items WL.10.1 and WL.10.2).</p> <p>Determine whether guards are required because the object to be welded or cut cannot be moved and all fire hazards cannot be removed.</p> <p>Verify that, wherever there are floor openings or cracks in the flooring that cannot be closed, precautions are taken so that no readily combustible materials on the floor below will be exposed to sparks which might drop through the floor.</p> <p>(NOTE: This requirement also applies when there are cracks or holes in walls, open doorways, and open or broken windows.)</p> <p>Verify that suitable fire extinguishing equipment is maintained in a state of readiness for instant use.</p> <p>(NOTE: Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers depending upon the nature and quantity of the combustible</p>

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<b>WL.10.5.</b> Fire watchers must be present under certain circumstances (29 CFR 1910.252(a) (2)(iii)(A)).	<p>material exposed.)</p> <p>Verify that fire watchers are present whenever:</p> <ul style="list-style-type: none"> <li>- welding or cutting is performed in locations where other than a minor fire might develop, or</li> <li>- any of the following conditions exist:             <ul style="list-style-type: none"> <li>- appreciable combustible material, in building construction or contents, is closer than 35 ft (10.7 m) to the point of operation</li> <li>- appreciable combustibles are more than 35 ft (10.7 m) away but are easily ignited by sparks</li> <li>- wall or floor openings within a 35-ft (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors</li> <li>- combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.</li> </ul> </li> </ul>
<b>WL.10.6.</b> Required fire watchers must themselves meet specific requirements (29 CFR 1910.252(a)(2) (iii)(B)).	<p>Verify that required fire watchers:</p> <ul style="list-style-type: none"> <li>- have fire extinguishing equipment readily available and are trained in its use</li> <li>- are familiar with facilities for sounding an alarm in the event of a fire</li> <li>- watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or else sound the alarm.</li> </ul> <p>Verify that a fire watch is maintained for at least 0.5 hr after completion of welding or cutting operations to detect and extinguish possible smoldering fires.</p>
<b>WL.10.7.</b> An inspection must be conducted before workers may proceed with cutting or welding (29 CFR 1910.252 (a)(2)(iv)).	<p>Verify that the area is inspected by the individual responsible for authorizing cutting and welding operations before workers proceed with cutting or welding.</p> <p>Verify that the person who does the inspection designates precautions to be followed in granting authorization to proceed, preferably in the form of a written permit.</p>
<b>WL.10.8.</b> Special precautions with regard to floors must be taken in certain circumstances (29 CFR 1910.252(a)(2)(v)).	<p>Verify that, where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor is swept clean for a radius of 35 ft (10.7 m).</p> <p>Verify that combustible floors are kept wet, covered with damp sand, or are protected by fire-resistant shields.</p> <p>Verify that, where floors have been wet down, personnel operating arc welding or cutting equipment are protected from possible shock.</p>

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<b>WL.10.9.</b> Cutting and welding are prohibited in certain situations (29 CFR 1910.252(a)(2)(vi)).	<p>Verify that neither cutting nor welding take place:</p> <ul style="list-style-type: none"> <li>- in areas not authorized by management</li> <li>- in sprinklered buildings while such protection is impaired</li> <li>- in the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air)</li> <li>- in the presence of explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment that have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts</li> <li>- in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.</li> </ul>
<b>WL.10.10.</b> Combustibles must be relocated where practicable (29 CFR 1910.252(a)(2)(vii)).	Verify that, where practicable, all combustibles are relocated at least 35 ft (10.7 m) from the work site.
<b>WL.10.11.</b> Combustibles must be protected when relocation is impracticable (29 CFR 1910.252(a)(2)(vii)).	Verify that, where relocation is impracticable, combustibles are protected with flameproof covers or otherwise shielded with metal or asbestos guards or curtains.
<b>WL.10.12.</b> Ducts and conveyor systems that might carry sparks to distant combustibles must be suitably protected or shut down (29 CFR 1910.252(a)(2)(viii)).	Verify that ducts and conveyor systems that might carry sparks to distant combustibles are suitably protected or shut down.
<b>WL.10.13.</b> Where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards must be provided to prevent ignition (29 CFR 1910.252(a)(2)(ix)).	Verify that, where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards are provided.
<b>WL.10.14.</b> Certain precautions must be taken if welding is to be done on a metal wall, partition, ceiling, or roof (29 CFR 1910.252(a)(2)(x)).	<p>Verify that, if welding is to be done on a metal wall, partition, ceiling, or roof, precautions are taken to prevent ignition, due to conduction or radiation, of combustibles on the other side.</p> <p>(NOTE: The preferred precaution is to relocate the combustibles.)</p> <p>Verify that, where combustibles are not relocated, a fire watch is provided on the</p>

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<p><b>WL.10.15.</b> Welding must not be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction (29 CFR 1910.252 (a)(2)(xi)).</p>	<p>opposite side from the work.</p> <p>Verify that welding is not attempted on metal partitions, walls, ceilings, or roofs having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.</p>
<p><b>WL.10.16.</b> Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs must not be undertaken if the work is close enough to cause ignition by conduction (29 CFR 1910.252(a)(2)(xii)).</p>	<p>Verify that cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs is not undertaken if the work is close enough to cause ignition by conduction.</p>
<p><b>WL.10.17.</b> The installation has certain responsibilities with regard to safe usage of cutting and welding equipment (29 CFR 1910.252(a)(2) (xiii)).</p>	<p>Verify that the installation:</p> <ul style="list-style-type: none"> <li>- establishes areas for cutting and welding, based on fire potentials of facilities</li> <li>- establishes procedures for cutting and welding in areas other than the established ones</li> <li>- designates an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes</li> <li>- ensures that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process</li> <li>- advises all contractors about flammable materials or hazardous conditions of which they may not be aware.</li> </ul>
<p><b>WL.10.18.</b> Supervisors of welders and cutters have specific responsibilities and duties (29 CFR 1910.252(a)(2) (xiv)).</p>	<p>Verify that the supervisor:</p> <ul style="list-style-type: none"> <li>- sees to the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process</li> <li>- determines the combustible materials and hazardous areas present or likely to be present in the work location</li> <li>- protects combustibles from ignition by: <ul style="list-style-type: none"> <li>- having the work moved to a location free from dangerous combustibles</li> <li>- having the combustibles moved to a safe distance from the work if the work cannot be moved, or having the combustibles properly shielded against ignition</li> </ul> </li> <li>- seeing to it that cutting and welding are so scheduled that operations that might expose combustibles to ignition are not started during cut-</li> </ul>

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<p><b>WL.10.19.</b> Cutting or welding are permitted only in areas that are or have been made fire safe (29 CFR 1910.252(a)(2)(xv)).</p> <p><b>WL.10.20.</b> No welding, cutting, or other hot work must be performed on used drums, barrels, tanks or other containers until certain requirements have been met (29 CFR 1910.252(a)(3)(i)).</p> <p><b>WL.10.21.</b> All hollow spaces, cavities, or containers must be vented to permit the escape of air or gases before preheating (29 CFR 1910.252(a)(3)(ii)).</p> <p><b>WL.10.22.</b> Certain requirements must be met when arc welding is to be suspended for any substantial period of time (29 CFR 1910.252(a)(4)(i)).</p>	<p style="text-align: center;">ting or welding</p> <ul style="list-style-type: none"> <li>- secures authorization for the cutting or welding operations from the designated authority</li> <li>- determines that the cutter or welder secures his approval that conditions are safe before going ahead</li> <li>- determines that fire protection and extinguishing equipment are properly located at the site</li> <li>- sees to it that fire watchers are available at the site when fire watches are required.</li> </ul> <p>Verify that cutting and welding take place only in areas that are or have been made fire safe.</p> <p>(NOTE: When work cannot be moved practically, as in most construction work, the area is to be made safe by removing combustibles or protecting combustibles from ignition sources.)</p> <p>Verify that no welding, cutting, or other hot work is performed on used drums, barrels, tanks, or other containers until:</p> <ul style="list-style-type: none"> <li>- they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present nor any substances such as greases, tars, acids, or other materials that, when subjected to heat, might produce flammable or toxic vapors</li> <li>- any pipe lines or connections to the drum or vessel have been disconnected or blanked.</li> </ul> <p>Verify that all hollow spaces, cavities, or containers are vented to permit the escape of air or gases before preheating.</p> <p>(NOTE: Purging with inert gas is recommended.)</p> <p>Verify that, when arc welding is to be suspended for any substantial period of time:</p> <ul style="list-style-type: none"> <li>- all electrodes are removed from the holders</li> <li>- the holders are carefully located so that accidental contact cannot occur</li> <li>- the machine is disconnected from the power source.</li> </ul> <p>(NOTE: Examples of substantial periods of time are during lunch or overnight.)</p>

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<b>WL.10.23.</b> Torch valves must be closed and the gas supply to the torch positively shut off under certain circumstances (29 CFR 1910.252(a)(4)(ii)).	<p>Verify that torch valves are closed and that the gas supply to the torch is positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time.</p> <p>Verify that the torch and hose are also removed from the confined space, where practicable.</p>

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<b>REGULATORY REQUIREMENTS:</b>	<b>REVIEWER CHECKS:</b> September 1997
<p><b>GENERAL REQUIREMENTS</b></p> <p><b>WL.20</b> <b>Protection of Personnel</b></p> <p><b>WL.20.1.</b> A welder or helper working on platforms, scaffolds, or runways must be protected against falling (29 CFR 1910.252(b)(1)(i)).</p> <p><b>WL.20.2.</b> Welders must place welding cable and other equipment so that it is clear of passageways, ladders, and stairways (29 CFR 1910.252(b)(1)(ii)).</p> <p><b>WL.20.3.</b> The use of eye protection in the course of welding, cutting, or brazing is required in certain circumstances (29 CFR 1910.252(b)(2)(i)).</p> <p><b>WL.20.4.</b> Helmets and hand shields must meet specific requirements (29 CFR 1910.252(b)(2)(ii)).</p>	<p>Verify that welders or helpers working on platforms, scaffolds, or runways are protected against falling.</p> <p>(NOTE: This may be accomplished by the use of railings, safety belts, life lines, or some other equally effective safeguards.)</p> <p>Verify that welders place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.</p> <p>Verify that helmets or hand shields are used during all arc welding or arc cutting operations.</p> <p>(NOTE: This requirement does not apply to submerged arc welding.)</p> <p>Verify that helpers or attendants are also provided with proper eye protection.</p> <p>Verify that goggles or other suitable eye protection are used during all gas welding or oxygen cutting operations.</p> <p>(NOTE: Spectacles without side shields, with suitable filter lenses, are permitted for use during gas welding operations on light work, for torch brazing, or for inspection.)</p> <p>Verify that all operators and attendants of resistance welding or resistance brazing equipment use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required.</p> <p>Verify that eye protection in the form of suitable goggles is provided, where needed, for brazing operations other than those covered in this checklist item.</p> <p>Verify that helmets and hand shields are made of a material which is an insulator for heat and electricity.</p> <p>Verify that helmets, shields, and goggles are not readily flammable.</p>

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<p><b>WL.20.5.</b> Protection from arc welding rays must meet specific requirements (29 CFR 1910.252(b)(2)(iii)).</p>	<p>Verify that helmets, shields, and goggles are capable of withstanding sterilization.</p> <p>Verify that helmets and hand shields are arranged to protect the face, neck, and ears from direct radiant energy from the arc.</p> <p>Verify that helmets are provided with filter plates and cover plates designed for easy removal.</p> <p>Verify that all parts are constructed of a material which will not readily corrode or discolor the skin.</p> <p>Verify that goggles are ventilated to prevent fogging of the lenses as much as practicable.</p> <p>Verify that all glass for lenses is tempered, substantially free from striae, air bubbles, waves, and other flaws.</p> <p>Verify that the front and rear surfaces of lenses and windows are smooth and parallel.</p> <p>(NOTE: This requirement does not apply when a lens is ground to provide proper optical correction for defective vision.)</p> <p>Verify that lenses bear some permanent distinctive marking by which the source and shade may be readily identified.</p> <p>(NOTE: See 29 CFR 1910.252(b)(2)(ii)(H) for recommended shades for various welding operations.)</p> <p>Verify that, where the work permits, the welder is enclosed in an individual booth painted with a finish of low reflectivity (such as zinc oxide and lamp black) or is enclosed with noncombustible screens similarly painted.</p> <p>Verify that booths and screens permit circulation of air at floor level.</p> <p>Verify that workers or other persons adjacent to the welding areas are protected from the rays by noncombustible or flameproof screens or shields or are required to wear appropriate goggles.</p>

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<b>WL.20.6.</b> Personal protective equipment (PPE) for personnel exposed to the hazards created by welding, cutting, or brazing operations must meet specific requirements (29 CFR 1910.252(b)(3)).	Verify that PPE for personnel exposed to the hazards created by welding, cutting, or brazing operations meets the requirements of 29 CFR 1910.132 (see the checklist items in PE.10.)
<b>WL.20.7.</b> Work in confined spaces must be undertaken only when there is proper ventilation (29 CFR 1910.252(b)(4)(ii)).	Verify that confined spaces are properly ventilated (see 29 CFR 1910.252(c) (the checklist items in WL.30)).
<b>WL.20.8.</b> Gas cylinders and machinery used when welding or cutting is being performed in confined spaces must be properly positioned (29 CFR 1910.252(b)(4)(iii)).	Verify that the gas cylinders and welding machines are left on the outside of the confined space.  Verify that heavy portable equipment mounted on wheels is securely blocked before operations are started.
<b>WL.20.9.</b> Certain equipment must be provided and certain procedures must be followed where a welder has to enter a confined space through a manhole or other small opening (29 CFR 1910.252(b)(4)(iv)).	Verify that means are provided for quickly removing welders in case of emergency.  Verify that, when safety belts and lifelines are used for this purpose, they are so attached to the welder's body that his body cannot be jammed in a small exit opening.  Verify that an attendant with a pre-planned rescue procedure is stationed outside to observe the welder at all times.  Verify that the attendant is capable of putting rescue operations into effect.
<b>WL.20.10.</b> Certain procedures must be followed when welding is to be suspended for any substantial period of time (29 CFR 1910.252 (b)(4)(v)).	Verify that all electrodes are removed from the holders and the holders carefully located so that accidental contact cannot occur.  Verify that the machine is disconnected from the power source.  (NOTE: Examples of a substantial period of time are during lunch and over-night.)

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<b>WL.20.11.</b> Torch valves must be closed and gas cylinders shut off whenever the torch is not to be used for a substantial period of time (29 CFR 1910.252(b)(4)(vi)).	<p>Verify that torch valves are closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area.</p> <p>Verify that, where practicable, the torch and hose are removed from the confined space.</p>
<b>WL.20.12.</b> Warnings must be provided when welding operations are complete (29 CFR 1910.252 (b)(4)(vii)).	<p>Verify that the welder marks the hot metal or provides some other means of warning other workers after welding operations are complete.</p>

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<p><b>GENERAL REQUIREMENTS</b></p> <p><b>WL.30</b> <b>Health Protection and Ventilation</b></p> <p><b>WL.30.1.</b> Screens must be arranged in a certain manner when welding must be performed in a space entirely screened on all sides (29 CFR 1910.252 (c)(1)(ii)).</p> <p><b>WL.30.2.</b> Local exhaust or general ventilating systems must be provided and arranged to keep the amount of toxic fumes, gases, or dusts below certain levels (29 CFR 1910.252(c)(1)(iii)).</p> <p><b>WL.30.3.</b> Mechanical ventilation must be provided under certain circumstances (29 CFR 1910.252(c)(2)(i) and 1910.252(c)(2)(ii)).</p>	<p>Verify that screens are arranged so that no serious restriction of ventilation exists.</p> <p>(NOTE: It is desirable to have the screens so mounted that they are about 2 ft (0.61 m) above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.)</p> <p>Verify that local exhaust or general ventilating systems are provided.</p> <p>Verify that the local exhaust or general ventilating systems keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in 29 CFR 1910.1000 (see Chapter 24: Air Contaminants).</p> <p>Verify that mechanical ventilation is provided when welding or cutting is done in the following circumstances:</p> <ul style="list-style-type: none"> <li>- in a space of less than 10,000 ft (284 m) per welder</li> <li>- in a room having a ceiling height of less than 16 ft (5 m)</li> <li>- in confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.</li> </ul> <p>(NOTE: Natural ventilation is considered sufficient for welding or cutting operations where the above restrictions are not present.)</p> <p>(NOTE: The requirement to provide mechanical ventilation does not apply when the welding or cutting is done on metals other than the following:</p> <ul style="list-style-type: none"> <li>- fluorine compounds</li> <li>- zinc</li> <li>- lead</li> <li>- beryllium</li> <li>- cadmium</li> <li>- mercury</li> <li>- stainless steel.</li> </ul>

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<p><b>WL.30.4.</b> The rate of ventilation must meet certain minimum standards (29 CFR 1910.252(c) (2)(ii)).</p> <p><b>WL.30.5.</b> Mechanical local exhaust ventilation must be provided by certain means only (29 CFR 1910.252(c)(3)).</p> <p><b>WL.30.6.</b> Ventilation in confined spaces must meet specific standards (29 CFR 1910.252(c)(4)(i)).</p> <p><b>WL.30.7.</b> Approved airline respirators or hose masks must be used in certain circumstances (29 CFR 1910.252(c)(4)(ii)).</p> <p><b>WL.30.8.</b> Approved hose masks with blowers or self-contained breathing equipment must be used in certain circumstances (29 CFR 1910.252(c)(4)(iii)).</p>	<p>For these specific materials, see the ventilation requirements in 29 CFR 1910.252(c)(5) through (c)(12) (checklist items WL.30.11 through WL.30.187.))</p> <p>Verify that ventilation takes place at the minimum rate of 2000 ft<sup>3</sup> (57 m<sup>3</sup>) per minute per welder.</p> <p>(NOTE: This requirement does not apply where proper local exhaust hoods and booths (see below) or airline respirators approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) are provided.)</p> <p>Verify that mechanical local exhaust ventilation is provided by either of the following means:</p> <ul style="list-style-type: none"> <li>- freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of air-flow sufficient to maintain a velocity in the direction of the hood of 100 linear ft (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding, or</li> <li>- a fixed enclosure with a top and no fewer than two sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear ft (30 m) per minute.)</li> </ul> <p>Verify that all welding and cutting operations carried on in confined spaces are adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency.</p> <p>(NOTE: This applies not only to the welder but also to helpers and other personnel in the immediate vicinity.)</p> <p>Verify that all air replacing air that has been withdrawn is clean and respirable.</p> <p>Verify that airline respirators or hose masks approved by the MSHA and NIOSH are used in circumstances where it is impossible to provide proper ventilation.</p> <p>Verify that hose masks with blowers or self-contained breathing equipment are used in areas immediately hazardous to life.</p> <p>Verify that the breathing equipment is approved by the MSHA and NIOSH.</p>

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<b>WL.30.9.</b> Helpers must be stationed outside confined spaces under certain circumstances (29 CFR 1910.252(c)(4)(iv)).	Verify that helpers are stationed outside confined spaces where welding operations are carried on and where welders and helpers are provided with hose masks, hose masks with blowers, or self-contained breathing equipment approved by the MSHA and NIOSH.
<b>WL.30.10.</b> Oxygen must never be used for ventilation (29 CFR 1910.252 (c)(4)(v)).	Verify that oxygen is never used for ventilation.
<b>WL.30.11.</b> Welding or cutting done in confined spaces with fluxes, coverings, or other materials that contain fluorine compounds must be done in accordance with certain provisions (29 CFR 1910.252(c)(5)(i)).	<p>Verify that welding or cutting done in confined spaces with fluxes, coverings, or other materials that contain fluorine compounds is done in accordance with the provisions of 29 CFR 1910.252(c)(4) (see checklist items WL.30.6 through WL.30.10).</p> <p>(NOTE: A fluorine compound is one that contains fluorine, as an element in chemical combination, not as a free gas.)</p> <p>(NOTE: The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, experience has shown such protection to be desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that the fluorides liberated are below the maximum allowable concentration, such protection is not necessary.)</p>
<b>WL.30.12.</b> Welding or cutting involving zinc must meet specific requirements as to ventilation (29 CFR 1910.252(c)(6)).	<p>Verify that welding or cutting done in confined spaces and involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials is done in accordance with the provisions of 29 CFR 1910.252(c)(4) (see checklist items WL.30.6 through WL.30.10).</p> <p>Verify that welding or cutting done indoors that involves zinc-bearing base or filler metals coated with zinc-bearing materials is done in accordance with the requirements of 29 CFR 1910.252(c)(3) (see checklist item WL.30.5).</p>
<b>WL.30.13.</b> Welding involving lead-base metals must meet specific requirements as to ventilation (29 CFR 1910.252(c)(7)).	<p>Verify that welding done in confined spaces that involves lead-base metals is done in accordance with the provisions of 29 CFR 1910.252(c)(4) (see checklist items WL.30.6 through WL.30.10).</p> <p>(NOTE: Lead-base metals are sometimes erroneously called 'lead burning'.)</p> <p>Verify that welding done indoors that involves lead-base metals is done in accordance with the requirements of 29 CFR 1910.252(c)(3) (see checklist item WL.30.5).</p> <p>Verify that, in confined spaces or indoors, welding or cutting involving metals containing lead, other than as an impurity, or involving metals coated with lead-</p>

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<p><b>WL.30.14.</b> Welding or cutting involving beryllium must meet specific requirements as to ventilation (29 CFR 1910.252 (c)(8)).</p>	<p>bearing materials, including paint, is done using local exhaust ventilation or airline respirators.</p> <p>Verify that outdoors such operations are done using respiratory protective equipment approved by MSHA and NIOSH for such purposes.</p> <p>Verify that in all cases, workers in the immediate vicinity of the cutting operation are protected as necessary by local exhaust ventilation or airline respirators.</p> <p>Verify that welding or cutting (indoors, outdoors, or in confined spaces) involving beryllium-containing base or filler metals is done using local exhaust ventilation and airline respirators.</p> <p>(NOTE: This requirement does not apply if atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000 (see Chapter 24: Air Contaminants).)</p> <p>Verify that, in all cases, workers in the immediate vicinity of the welding or cutting operations are protected as necessary by local exhaust ventilation or airline respirators.</p>
<p><b>WL.30.15.</b> Welding or cutting involving cadmium must meet specific requirements as to ventilation (29 CFR 1910.252(c)(9)).</p>	<p>Verify that welding or cutting indoors or in confined spaces that involves cadmium-bearing or cadmium-coated base metals is done using local exhaust ventilation or airline respirators.</p> <p>(NOTE: This requirement does not apply if atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000 (see Chapter 24: Air Contaminants).)</p> <p>Verify that outdoors such operations are done using respiratory protective equipment such as fume respirators approved by the MSHA and NIOSH for such purposes.</p> <p>Verify that welding (brazing) involving cadmium-bearing filler metals is done using ventilation as prescribed 29 CFR 1910.252(c)(3) (see checklist item WL.30.5) or 29 CFR 1910.252(c)(4) (see checklist items WL.30.6 through WL.30.10), if the work is to be done in a confined space.</p>

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<p><b>WL.30.16.</b> Welding or cutting involving mercury must meet specific requirements as to ventilation (29 CFR 1910.252(c)(10)).</p>	<p>Verify that welding or cutting indoors or in a confined space involving metals coated with mercury-bearing materials, including paint, is done using local exhaust ventilation or airline respirators.</p> <p>(NOTE: This requirement does not apply if atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000 (see Chapter 24: Air Contaminants).)</p> <p>Verify that outdoors such operations are done using respiratory protective equipment approved by the MSHA and the NIOSH for such purposes.</p>
<p><b>WL.30.17.</b> The use of cleaning compounds in connection with welding or cutting operations is subject to certain requirements (29 CFR 1910.252(c)(11)).</p>	<p>Verify that appropriate precautions (such as manufacturers instructions) are followed in the use of cleaning materials.</p> <p>Verify that degreasing and other cleaning operations involving chlorinated hydrocarbons are so located that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation.</p> <p>Verify that trichloroethylene and perchloroethylene are kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.</p>
<p><b>WL.30.18.</b> Certain methods for cutting stainless steel must be carried out using mechanical ventilation adequate to remove the fumes generated (29 CFR 1910.252(c)(12)).</p>	<p>Verify that mechanical ventilation adequate to remove the fumes generated is used in the course of:</p> <ul style="list-style-type: none"> <li>- oxygen cutting of stainless steel, using either a chemical flux or iron powder</li> <li>- gas-shielded arc cutting of stainless steel.</li> </ul>
<p><b>WL.30.19.</b> Provision must be made for first aid in the context of welding and cutting operations (29 CFR 1910.252(c)(13)).</p>	<p>Verify that first-aid equipment is available at all times.</p> <p>Verify that all injuries are reported as soon as possible for medical attention.</p> <p>Verify that first aid is rendered until medical attention can be provided.</p>



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<p><b>GENERAL REQUIREMENTS</b></p> <p><b>WL.40</b> <b>Industrial Applications</b></p> <p><b>WL.40.1.</b> Industrial applications to transmission pipelines are subject to certain requirements (29 CFR 1910.252(d)(1)(i)).</p> <p><b>WL.40.2.</b> Field shop operations are subject to certain requirements (29 CFR 1910.252(d)(1)(ii)).</p> <p><b>WL.40.3.</b> When arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock must be supplied (29 CFR 1910.252(d)(1)(iii)).</p> <p><b>WL.40.4.</b> Pressure testing of pipelines must meet certain standards (29 CFR 1910.252(d)(1)(iv)).</p> <p><b>WL.40.5.</b> Welding and cutting in connection with mechanical piping systems must meet specific standards (29 CFR 1910.252(d)(2)(i)).</p>	<p>Verify that industrial applications meet the requirements of the following:</p> <ul style="list-style-type: none"> <li>- 29 CFR 1910.252(b) (see the checklist items in WL.20)</li> <li>- 29 CFR 1910.252(c) (see the checklist items in WL.30)</li> <li>- 29 CFR 1910.254 (see the checklist items in WL.60).</li> </ul> <p>Verify that, where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations, the requirements of the following are met:</p> <ul style="list-style-type: none"> <li>- 29 CFR 1910.252(b) (see the checklist items in WL.20)</li> <li>- 29 CFR 1910.252(c) (see the checklist items in WL.30)</li> <li>- 29 CFR 1910.253 (see the checklist items in WL.50)</li> <li>- 29 CFR 1910.254 (see the checklist items in WL.60).</li> </ul> <p>Verify that, when arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock is supplied.</p> <p>Verify that the workers and the public are protected against injury by the blowing out of closures or other pressure restraining devices.</p> <p>Verify that protection is provided against expulsion of loose dirt that may have become trapped in the pipe.</p> <p>Verify that welding or cutting in connection with mechanical piping systems meets the following requirements:</p> <ul style="list-style-type: none"> <li>- 29 CFR 1910.252(a) through 1910.252(c) (see the checklist items in WL.10 through WL.30)</li> <li>- 29 CFR 1910.253 (see the checklist items in WL.50)</li> <li>- 29 CFR 1910.254 (see the checklist items in WL.60).</li> </ul>



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<p><b>WL.50</b>  <b>OXYGEN-FUEL WELDING AND CUTTING</b></p> <p><b>WL.50.1.</b> Precautions must be taken to guard against mixtures of fuel gases and air or oxygen (29 CFR 1910.253(a)(1)).</p> <p><b>WL.50.2.</b> Certain pressure requirements apply to the generation, piping, and use of acetylene (29 CFR 1910.253(a)(2)).</p> <p><b>WL.50.3.</b> The use of liquid acetylene is prohibited (29 CFR 1910.253(a)(2)).</p> <p><b>WL.50.4.</b> Only approved apparatus such as torches, regulators or pressure-reducing valves, acetylene generators, and manifolds must be used (29 CFR 1910.253(a)(3)).</p> <p><b>WL.50.5.</b> Workmen in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems must meet certain</p>	<p>Verify that precautions are taken to guard against mixtures of fuel gases and air or oxygen.</p> <p>Verify that no device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption is allowed.</p> <p>(NOTE: This prohibition does not apply if the device or attachment has been approved for the purpose.)</p> <p>(NOTE: This requirement does not apply at the burner or in a standard torch.)</p> <p>Verify that acetylene is never generated, piped, or utilized at a pressure in excess of 15 psig (103 kPa gauge pressure) or 30 psia (206 kPa absolute).</p> <p>(NOTE: This requirement does not apply to piping in approved cylinder manifolds.)</p> <p>(NOTE: This requirement is not intended to apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use.)</p> <p>Verify that no liquid acetylene is used on the installation.</p> <p>Verify that only approved apparatus is used.</p> <p>Verify that workmen in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems, are instructed and judged competent by the installation for this important work before being left in charge.</p> <p>Verify that rules and instructions covering the operation and maintenance of</p>

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requirements (29 CFR 1910.253(a)(4)).	oxygen or fuel-gas supply equipment (including generators), and oxygen or fuel-gas distribution piping systems are readily available.
<b>WL.50.6.</b> The marking of compressed gas cylinders must meet specific requirements (29 CFR 1910.253(b)(1)(ii)).	<p>Verify that compressed gas cylinders are legibly marked with either the chemical or the trade name of the gas.</p> <p>Verify that such marking is by means of stenciling, stamping, or labeling, and is not readily removable.</p>
<b>WL.50.7.</b> The storage of cylinders must meet specific requirements (29 CFR 1910.253(b)(2)).	<p>Verify that, whenever practical, the marking is located on the shoulder of the cylinder.</p> <p>Verify that cylinders are kept away from radiators and other sources of heat.</p> <p>Verify that, inside of buildings, cylinders are stored in a well-protected, well-ventilated, dry location, at least 20 ft (6.1 m) from highly combustible materials such as oil or excelsior.</p> <p>Verify that cylinders are stored in definitely assigned places away from elevators, stairs, or gangways.</p> <p>Verify that assigned storage spaces are located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons.</p> <p>Verify that cylinders are not kept in unventilated enclosures such as lockers and cupboards.</p> <p>Verify that empty cylinders have their valves closed.</p> <p>Verify that valve protection caps, where cylinder is designed to accept a cap, are always in place, hand-tight.</p> <p>(NOTE: This valve protection requirement does not apply when cylinders are in use or connected for use.)</p>
<b>WL.50.8.</b> The storage of fuel gas cylinders must meet specific requirements (29 CFR 1910.253(b)(3)).	<p>Verify that cylinders inside a building do not exceed a total gas capacity of 2000 ft<sup>3</sup> (56 m<sup>3</sup>) or 300 lb (135.9 kg) of liquefied petroleum gas.</p> <p>(NOTE: This limitation does not include cylinders in actual use or attached and ready for use.)</p> <p>Verify that a separate room or compartment is provided for storage in excess of 2000 ft<sup>3</sup> (56 m<sup>3</sup>) total gas capacity of cylinders or 300 (135.9 kg) pounds of liquefied petroleum gas.</p>

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<p><b>WL.50.9.</b> The storage of oxygen must meet specific requirements (29 CFR 1910.253(b)(4)(i) through 29 CFR 1910.253 (b)(4) (iii)).</p>	<p>(NOTE: Cylinders may be kept outside or in a special building (e.g., in a separate manifold building or room).)</p> <p>Verify that the walls, partitions, floors, and ceilings of such a separate room or compartment are of noncombustible construction having a fire-resistance rating of at least one hr.</p> <p>Verify that the walls or partitions of such a separate room or compartment are continuous from floor to ceiling and properly anchored.</p> <p>Verify that at least one wall of the separate room or compartment is an exterior wall.</p> <p>Verify that openings from such a separate room or compartment to other parts of the building are protected by a swinging type, self-closing door for a Class B opening and have a rating of at least one hr.</p> <p>Verify that windows in partitions are wired glass and approved metal frames with fixed sash.</p> <p>Verify that windows in partitions are installed in accordance with the Standard for Installation of Fire Doors and Windows, NFPA 80-1970.</p> <p>Verify that special buildings, rooms, or compartments have no open flame for heating or lighting and are well ventilated.</p> <p>Verify that acetylene cylinders are stored valve end up.</p> <p>Verify that oxygen cylinders are not stored</p> <ul style="list-style-type: none"> <li>- near highly combustible material, especially oil and grease; or</li> <li>- near reserve stocks of carbide and acetylene or other fuel-gas cylinders; or</li> <li>- near any other substance likely to cause or accelerate fire; or</li> <li>- in an acetylene generator compartment.</li> </ul> <p>Verify that oxygen cylinders stored in outside generator houses are separated from the generator or carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hr.</p> <p>Verify that this partition has no openings and is gas-tight.</p> <p>Verify that oxygen cylinders in storage are separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 ft (6.1 m) or by a noncombustible barrier at least 5 ft (1.5 m) high having a fire-resistance rating of at least 0.5 hr.</p>

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<b>WL.50.10.</b> The operation of cylinders is subject to specific requirements (29 CFR 1910.253(b)(5)(i) through 1910.253(b) (5)(ii)).	<p>Verify that cylinders, cylinder valves, couplings, regulators, hose, and apparatus are kept free from oily or greasy substances.</p> <p>Verify that neither oxygen cylinders nor apparatus are handled with oily hands or gloves.</p> <p>Verify that jets of oxygen are never permitted to strike oily surfaces or greasy clothes, or to enter a fuel oil or other storage tank.</p> <p>Verify that, when transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform is used.</p> <p>Verify that neither slings nor electric magnets are used for this purpose.</p> <p>Verify that, where cylinders are designed to accept valve-protection caps, such caps are always in place during transport.</p> <p>Verify that cylinders are not dropped or struck or permitted to strike each other violently.</p> <p>Verify that valve-protection caps are not used for lifting cylinders from one vertical position to another.</p> <p>Verify that no bars are used under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed.</p> <p>(NOTE: The use of warm (not boiling) water is recommended for this purpose.)</p> <p>Verify that regulators are removed and that valve-protections caps (when provided for) are put in place before cylinders are moved.</p> <p>(NOTE: This requirement does not apply if the cylinders are secured on a special truck.)</p> <p>Verify that cylinders without fixed hand wheels have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service.</p> <p>(NOTE: In multiple cylinder installations only one key or handle is required for each manifold.)</p> <p>Verify that cylinder valves are closed before moving cylinders.</p> <p>Verify that cylinder valves are closed when work is finished.</p> <p>Verify that the valves of empty cylinders are closed.</p> <p>Verify that cylinders are either kept far enough away from the actual welding or cutting operation that neither sparks, hot slag, nor flame will reach them, or that</p>

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	<p>fire-resistant shields are provided.</p> <p>Verify that cylinders are not placed where they might become part of an electric circuit.</p> <p>Verify that contacts with third rails, trolley wires, etc., are avoided.</p> <p>Verify that cylinders are kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines.</p> <p>Verify that practices such as the tapping of an electrode against a cylinder to strike an arc do not take place.</p> <p>Verify that cylinders, whether full or empty, are never used as rollers or supports.</p> <p>Verify that the numbers and markings stamped into cylinders are not tampered with.</p> <p>Verify that no one other than the gas supplier attempts to mix gases in a cylinder.</p> <p>Verify that no one except the owner of the cylinder or person authorized by him, refills a cylinder.</p> <p>Verify that no one tampers with safety devices in cylinders or valves.</p> <p>Verify that cylinders are not dropped or otherwise roughly handled.</p> <p>Verify that an oxygen regulator is attached to the cylinder valve before oxygen is used.</p> <p>(NOTE: This requirement does not apply if the cylinder is connected to a manifold.)</p> <p>Verify that, before connecting the regulator to the cylinder valve, the valve is opened slightly for an instant and then closed.</p> <p>Verify that the valve is opened while standing to one side of the outlet; never in front of it.</p> <p>Verify that neither hammers nor wrenches are used to open cylinder valves.</p> <p>Verify that the supplier is notified if valves cannot be opened by hand.</p> <p>Verify that cylinder valves are not tampered with.</p> <p>(NOTE: No one should attempt to repair cylinder valves. If trouble is experienced, the supplier should be sent a report promptly indicating the character of</p>

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<b>WL.50.11.</b> The operation and handling of cylinders is subject to specific requirements. (29 CFR 1910.253(b)(5)(iii)).	<p>the trouble and the cylinder's serial number. Supplier's instructions as to its disposition must be followed).</p> <p>Verify that complete removal of the stem from a diaphragm-type cylinder valve is avoided.</p> <p>Verify that fuel-gas cylinders are placed with valve end up whenever they are in use.</p> <p>Verify that liquefied gases are stored and shipped with the valve end up.</p> <p>Verify that cylinders are handled carefully.</p> <p>(NOTE: Rough handling, knocks, or falls are liable to damage the cylinder, valve or safety devices and cause leakage.)</p> <p>Verify that, before connecting a regulator to a cylinder valve, the valve is opened slightly and closed immediately.</p> <p>Verify that the valve is opened while standing to one side of the outlet; never in front of it.</p> <p>Verify that fuel-gas cylinder valves are never cracked near other welding work or near sparks, flame, or other possible sources of ignition.</p> <p>Verify that, before a regulator is removed from a cylinder valve, the cylinder valve is closed and the gas released from the cylinder.</p> <p>Verify that nothing is placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.</p> <p>Verify that, if cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, the cylinders are taken outdoors away from sources of ignition and slowly emptied.</p> <p>Verify that a warning is placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition.</p> <p>Verify that such cylinders are plainly tagged and that the supplier is promptly notified and his instructions followed as to their return.</p> <p>Verify that safety devices are not tampered with.</p> <p>Verify that fuel-gas is never used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.</p>

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<p><b>WL.50.12.</b> Fuel-gas manifolds must be approved either separately for each component part or as an assembled unit (29 CFR 1910.253(c)(1)(i)).</p> <p><b>WL.50.13.</b> The total capacity of fuel-gas cylinders connected to one manifold inside a building is limited (29 CFR 1910.253(c)(1)(ii)).</p> <p><b>WL.50.14.</b> Fuel-gas cylinders connected to one manifold having an aggregate capacity exceeding 300 lb (135.9 kg) of liquefied petroleum gas or 3000 ft<sup>3</sup> (84 m<sup>3</sup>) of other fuel-gas are subject to specific requirements (29 CFR 1910.253(c)(1)(iii)).</p>	<p>regulator attached to the cylinder valve or manifold.</p> <p>Verify that the cylinder valve is always opened slowly.</p> <p>Verify that an acetylene cylinder valve is not opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn.</p> <p>Verify that, where a special wrench is required, it is left in position on the stem of the valve while the cylinder is in use.</p> <p>Verify that, in the case of manifolded or coupled cylinders at least one such wrench is always available for immediate use.</p> <p>Verify that fuel-gas manifolds are approved either separately for each component part or as an assembled unit.</p> <p>Verify that the total capacity of fuel-gas cylinders connected to one manifold inside a building is limited to 300 lb (135.9 kg) of liquefied petroleum gas or 3000 ft<sup>3</sup> (84 m<sup>3</sup>) of other fuel-gas.</p> <p>(NOTE: More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 ft (15 m) apart or separated by a noncombustible barrier at least 5 ft (1.5 m) high having a fire-resistance rating of at least 0.5 hr.)</p> <p>(NOTE: This restriction does not apply when the conditions in 29 CFR 1910.253(c)(1)(iii) (see checklist item WL.50.14) are met.)</p> <p>Verify that fuel-gas cylinders connected to one manifold having an aggregate capacity exceeding 300 lb (135.9 kg) of liquefied petroleum gas or 3000 ft<sup>3</sup> (84 m<sup>3</sup>) of other fuel-gas are located:</p> <ul style="list-style-type: none"> <li>- outdoors, or</li> <li>- in a separate building or room constructed in accordance with the requirements of the remaining seven questions in this checklist item.</li> </ul> <p>Verify that such separate manifold rooms or buildings contain no open flames for heating or lighting and that they are well ventilated.</p> <p>Verify that the walls, partitions, floors, and ceilings of such a separate room or building are of noncombustible construction having a fire-resistance rating of at least 1 hr.</p>

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<p><b>WL.50.15.</b> High-pressure fuel-gas manifolds must be provided with approved pressure regulating devices (29 CFR 1910.253(c)(1)(v)).</p> <p><b>WL.50.16.</b> The location of oxygen manifolds is subject to certain restrictions (29 CFR 1910.253(c) (2)(ii)).</p> <p><b>WL.50.17.</b> The total gas capacity of oxygen cylinders connected to one manifold is limited (29 CFR 1910.253(c) (2)(iii)).</p> <p><b>WL.50.18.</b> Oxygen manifolds, to which cylinders having an aggregate capacity of more than 6000 ft<sup>3</sup> (168 m<sup>3</sup>) of oxygen are connected are subject to specific requirements as to location (29 CFR 1910.253(c)(2)(iv)).</p>	<p>Verify that the walls or partitions of such a separate room or building are continuous from floor to ceiling and properly anchored.</p> <p>Verify that at least one wall of the separate room or building is an exterior wall.</p> <p>Verify that openings from such a separate room to other parts of the building are protected by a swinging type, self-closing door for a Class B opening and have a rating of at least 1 hr.</p> <p>Verify that windows in partitions are wired glass and approved metal frames with fixed sash.</p> <p>Verify that high-pressure fuel-gas manifolds are provided with approved pressure regulating devices.</p> <p>Verify that no oxygen manifolds are located in an acetylene generator room.</p> <p>Verify that oxygen manifolds are separated from fuel-gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 ft (6.1 m) or by a noncombustible barrier at least 5 ft (1.5 m) high having a fire-resistance rating of at least 0.5 hr.</p> <p>Verify that the total gas capacity of oxygen cylinders connected to one manifold does not exceed 6000 ft<sup>3</sup> (168 m<sup>3</sup>).</p> <p>(NOTE: This restriction does not apply when the requirements of 29 CFR 1910.253(c)(2)(iv) (see checklist item WL.50.18) are met.)</p> <p>(NOTE: More than one such manifold with connected cylinders may be located in the same room provided that the manifolds are at least 5 ft (1.5 m) high and have a fire resistance rating of at least 0.5 hr.)</p> <p>Verify that oxygen manifolds to which cylinders having an aggregate capacity of more than 6000 ft<sup>3</sup> (168 m<sup>3</sup>) of oxygen are connected are located outdoors or in a separate noncombustible building.</p> <p>Verify that such a manifold, if located inside a building having other occupancy, is located in a separate room of noncombustible construction having a fire-resistance rating of at least 0.5 hr or in an area with no combustible material within 20 ft (6.1 m) of the manifold.</p>

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<b>WL.50.19.</b> High-pressure oxygen manifolds must be provided with approved pressure-regulating devices (29 CFR 1910.253(c)(2) (vi)).	Verify that high-pressure oxygen manifolds are provided with approved pressure-regulating devices.
<b>WL.50.20.</b> Low-pressure oxygen manifolds must meet specific design requirements (29 CFR 1910.253(c)(3)(i)).	<p>Verify that manifolds are of substantial construction suitable for use with oxygen at a pressure of 250 psig (1.7 MPa).</p> <p>Verify that manifolds have a minimum bursting pressure of 1000 psig (6.8 MPa).</p> <p>Verify that manifolds are protected by a safety relief device which will relieve at a maximum pressure of 500 psig (3.4 MPa).</p> <p>(NOTE: DOT-4L200 cylinders have safety devices which relieve at a maximum pressure of 250 psig (1.7 MPa) or at 235 psig (1.6 MPa) if vacuum insulation is used).</p>
<b>WL.50.21.</b> Hoses and hose connections for low-pressure oxygen manifolds must meet specific requirements (29 CFR 1910.253(c)(3)(ii)).	<p>Verify that hoses and hose connections for low-pressure oxygen manifolds meet the requirements of 29 CFR 1910.253(e)(5) (see checklist items WL.50.39 through WL.50.41.)</p> <p>Verify that hose has a minimum bursting pressure of 1000 psig (6.8 MPa).</p>
<b>WL.50.22.</b> Assembled manifolds and leads are subject to testing (29 CFR 1910.253(c)(3)(iii)).	<p>Verify that the assembled manifold including leads is tested and proven gas-tight at a pressure of 300 psig (2.04 MPa).</p> <p>Verify that the fluid used for testing oxygen manifolds is oil-free and not combustible.</p>
<b>WL.50.23.</b> Low-pressure oxygen manifolds must meet specific requirements as to location (29 CFR 1910.253(c)(3)(iv)).	Verify that the location of manifolds meets the requirements of 29 CFR 1910.253(c)(2)(ii) through 1910.253(c)(2)(v) (see checklist items WL.50.16 through WL.50.18).
<b>WL.50.24.</b> Low-pressure manifold must be marked with signs (29 CFR 1910.253(c)(3)(v)).	<p>Verify that a sign with the following legend is conspicuously posted at each manifold:</p> <p style="text-align: center;">Low-Pressure Manifold  Do Not Connect High-Pressure Cylinders  Maximum Pressure -- 250 psig (1.7 MPa)</p>
<b>WL.50.25.</b> Portable outlet headers must not be used indoors (29 CFR	<p>Verify that portable outlet headers are not used indoors.</p> <p>(NOTE: This prohibition does not apply to temporary service where the condi-</p>

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<p>1910.253(c)(4)(i)).</p> <p><b>WL.50.26.</b> Portable outlet headers must incorporate specific protective equipment (29 CFR 1910.253(e)(3)).</p> <p><b>WL.50.27.</b> Each outlet on the service piping from which oxygen or fuel-gas is withdrawn to supply a portable outlet header must be equipped with a readily accessible shutoff valve (29 CFR 1910.253 (c)(4)(ii)).</p> <p><b>WL.50.28.</b> Hose and hose connections used for connecting the portable outlet header to the service piping must meet specific requirements (29 CFR 1910.253(c)(4)(iii)).</p> <p><b>WL.50.29.</b> Master shut-off valves for both oxygen and fuel-gas must be provided at the entry end of the portable outlet header (29 CFR 1910.253 (c)(4)(iv)).</p> <p><b>WL.50.30.</b> Portable outlet headers for fuel-gas service must be provided with an approved hydraulic back-pressure valve (29 CFR 1910.253 (c)(4)(v)).</p>	<p>tions preclude a direct supply from outlets located on the service piping system.)</p> <p>Verify that fuel-gas and oxygen piping systems incorporate the following protective equipment:</p> <ul style="list-style-type: none"> <li>- backflow protection</li> <li>- flash-back protection</li> <li>- back-pressure protection.</li> </ul> <p>Verify that each outlet on the service piping from which oxygen or fuel-gas is withdrawn to supply a portable outlet header is equipped with a readily accessible shutoff valve.</p> <p>Verify that hose and hose connections used for connecting the portable outlet header to the service piping must comply with the provisions of 29 CFR 1910.253(e)(5) (see checklist items WL.50.39 through WL.50.41).</p> <p>Verify that master shutoff valves for both oxygen and fuel-gas are provided at the entry end of the portable outlet header.</p> <p>Verify that portable outlet headers for fuel-gas service are provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets.</p> <p>(NOTE: This requirement does not apply if an approved pressure-reducing regulator, an approved back-flow check valve, or an approved hydraulic back-pressure valve is installed at each outlet.)</p> <p>(NOTE: Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.)</p>

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<b>WL.50.31.</b> Each service outlet on portable outlet headers must be provided with a valve assembly that meets certain requirements (29 CFR 1910.253 (c)(4)(vi)).	Verify that each service outlet on portable outlet headers is provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve.
<b>WL.50.32.</b> Portable outlet headers must be provided with frames that meet certain requirements (29 CFR 1910.253(c)(4)(viii)).	Verify that portable outlet headers are provided with frames which will support the equipment securely in the correct operating position and protect them from damage during handling and operation.
<b>WL.50.33.</b> Proper procedures must be followed as part of the operation of manifolds (29 CFR 1910.253(c)(5)).	<p>Verify that cylinder manifolds are installed under the supervision of someone familiar with the proper practices with reference to their construction and use.</p> <p>Verify that all manifolds and parts used in methods of manifolding are used only for the gas or gases for which they are approved.</p> <p>Verify that, when acetylene cylinders are coupled, approved flash arresters are installed between each cylinder and the coupler block.</p> <p>(NOTE: For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.)</p> <p>Verify that the aggregate capacity of fuel-gas cylinders connected to a portable manifold inside a building does not exceed 3000 ft<sup>3</sup> (84 m<sup>3</sup>) of gas.</p> <p>Verify that acetylene and liquefied fuel-gas cylinders are manifolded in a vertical position.</p> <p>Verify that the pressure in the gas cylinders connected to and discharged simultaneously through a common manifold is approximately equal.</p>
<b>WL.50.34.</b> Painting and signs for service piping systems must meet specific requirements (29 CFR 1910.253(d) (4)).	<p>Verify that underground pipe and tubing and outdoor ferrous pipe and tubing are covered or painted with a suitable material for protection against corrosion.</p> <p>Verify that station outlets are marked to indicate the name of the gas.</p>
<b>WL.50.35.</b> The testing of piping systems must meet specific requirements (29 CFR 1910.253(d)(5)).	<p>Verify that piping systems are tested and proved gas-tight at 1.5 times the maximum operating pressure.</p> <p>Verify that piping systems are thoroughly purged of air before being placed in service</p>

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<p><b>WL.50.36.</b> Equipment must be installed and used only in the service for which it is approved and as recommended by the manufacturer (29 CFR 1910.253(e)(1)).</p> <p><b>WL.50.37.</b> Service piping systems must be protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location (29 CFR 1910.253(e)(2)).</p> <p><b>WL.50.38.</b> Station outlets must incorporate specific protective equipment (29 CFR 1910.253(e)(4)).</p>	<p>Verify that the material used for testing oxygen lines is oil-free and noncombustible.</p> <p>Verify that flames are never used to detect leaks.</p> <p>Verify that, when flammable gaslines or other parts of equipment are being purged of air or gas, sources of ignition are not permitted near uncapped openings.</p> <p>Verify that equipment is installed and used only in the service for which it is approved and as recommended by the manufacturer.</p> <p>Verify that service piping systems are protected by pressure relief devices that are set to function at not more than the design pressure of the systems and that discharge upwards to a safe location.</p> <p>Verify that each station outlet has a check valve, pressure regulator, hydraulic seal, or combination of these devices.</p> <p>(NOTE: This requirement also applies to portable outlet headers.)</p> <p>(NOTE: When approved pipeline protective equipment is located at the station outlet, no additional check valve, pressure regulator, or hydraulic seal is required.)</p> <p>Verify that each station outlet has a shutoff valve located on the upstream side of other station outlet equipment.</p> <p>Verify that, if the station outlet is equipped with a detachable regulator, the outlet terminates in a union connection.</p> <p>Verify that, if the station outlet is connected directly to a hose, the outlet terminates in a union connection.</p> <p>(NOTE: Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.)</p>

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<p><b>WL.50.39.</b> Hose for oxy-fuel gas service must meet certain specifications (29 CFR 1910.253 (e)(5)(i) and 29 CFR 1910.253 (e)(5)(ii)).</p> <p><b>WL.50.40.</b> Hose connections must meet certain specifications (29 CFR 1910.253(e)(5)(iii) and 29 CFR 1910.253 (e)(5)(iv)).</p> <p><b>WL.50.41.</b> Hose showing leaks, burns, worn places, or other defects rendering it unfit for service must be repaired or replaced (29 CFR 1910.253 (e)(5)(v)).</p> <p><b>WL.50.42.</b> Pressure-reducing regulators must be used only for the gas and pressures for which they are intended (29 CFR 1910.253(e)(6)(i)).</p>	<p>Verify that each station outlet is equipped with a detachable outlet seal cap secured in place.</p> <p>Verify that this cap is used to seal the outlet except when a hose, a regulator, or piping is attached.</p> <p>(NOTE: Where station outlets are equipped with backflow and flashback protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided that each outlet from such piping is equipped with a shutoff valve and provided that the fuel-gas capacity of any one torch does not exceed 15 ft<sup>3</sup> (0.42 m<sup>3</sup>) per hr. This note does not apply to machines.)</p> <p>Verify that, when parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, not more than 4 in. (10.2 cm) out of 12 in. (30.5 cm) are covered by tape.</p> <p>Verify that hose connections are clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 psi (2.04 MPa).</p> <p>Verify that oil-free air or an oil-free inert gas are used for the test.</p> <p>Verify that hose showing leaks, burns, worn places, or other defects rendering it unfit for service is repaired or replaced.</p> <p>Verify that pressure-reducing regulators are used only for the gas and pressures for which they are intended.</p>

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<b>WL.50.43.</b> When regulators or parts of regulators, including gauges, need repair, the work must be performed by skilled mechanics who have been properly instructed (29 CFR 1910.253(e)(6)(ii)).	Verify that, when regulators or parts of regulators, including gauges, need repair, the work is performed by skilled mechanics who have been properly instructed.
<b>WL.50.44.</b> Gauges on oxygen regulators must be properly marked (29 CFR 1910.253 (e)(6)(iii)).	Verify that gauges on oxygen regulators are marked USE NO OIL.
<b>WL.50.45.</b> Union nuts and connections on regulators must be inspected before use (29 CFR 1910.253 (e)(6)(iv)).	Verify that union nuts and connections on regulators are inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves.

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<p><b>WL.60</b>  <b>ARC WELDING AND CUTTING</b></p> <p><b>WL.60.1.</b> Welding equipment must be chosen for safe application to the work to be done (29 CFR 1910.254(a)(1) and 29 CFR 1910.254(b)(1)).</p> <p><b>WL.60.2.</b> Standard machines for arc welding service must meet specific design requirements (29 CFR 1910.254 (b)(2)(i) and 29 CFR 1910.254(b)(3)(iv)).</p> <p><b>WL.60.3.</b> Alternating-current machines must not exceed specified voltage limits (29 CFR 1910.254 (b)(3)(i)).</p> <p><b>WL.60.4.</b> Direct-current machines must not exceed specified voltage limits (29 CFR 1910.254(b)(3) (ii)).</p>	<p>Verify that welding equipment is chosen for safe application to the work to be done in accordance with the requirements of 29 CFR 1910.254(b) (see the checklist items in WL.60).</p> <p>(NOTE: For a.c. welding under wet conditions or warm surroundings where perspiration is a factor, the use of reliable automatic controls for reducing no load voltage is recommended to reduce the shock hazard.)</p> <p>Verify that standard machines for arc welding service are designed and constructed to carry their rated load with rated temperature rises where the temperature of the cooling air does not exceed 40 °C (104 °F) and where the altitude does not exceed 3300 ft (1005.8 m).</p> <p>Verify that standard machines for arc welding service are suitable for operation in atmospheres containing gases, dust, and light rays produced by the welding arc.</p> <p>Verify that, in unusual service conditions, machines are especially designed to safely meet the requirements of the service.</p> <p>(NOTE: The principal unusual service conditions are the following:</p> <ul style="list-style-type: none"> <li>- exposure to unusually corrosive fumes</li> <li>- exposure to steam or excessive humidity</li> <li>- exposure to excessive oil vapor</li> <li>- exposure to flammable gases</li> <li>- exposure to abnormal vibration or shock</li> <li>- exposure to excessive dust</li> <li>- exposure to weather</li> <li>- exposure to unusual seacoast or shipboard conditions.)</li> </ul> <p>Verify that a.c. manual arc welding and cutting machines do not exceed the limit of 80 volts.</p> <p>Verify that automatic (machine or mechanized) a.c. arc welding and cutting machines do not exceed the limit of 100 volts.</p> <p>Verify that neither manual d.c. arc welding and cutting machines nor automatic (machine or mechanized) ones exceed the limit of 100 volts.</p>

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<b>WL.60.5.</b> Means must be provided in certain circumstances to prevent the operator from making accidental contact with high voltage (29 CFR 1910.254(b)(3)(iii)).	Verify that, when special welding and cutting processes require values of open circuit voltages higher than those in checklist items WL.60.3 or WL.60.4, means are provided to prevent the operator from making accidental contact with the high voltage.  (NOTE: This may be accomplished by adequate insulation or by other means.)
<b>WL.60.6.</b> The installation of arc welding equipment must meet specific requirements (29 CFR 1910.254(c)(1)).	Verify that arc welding equipment is installed in accordance with 29 CFR 1910, subpart S.
<b>WL.60.7.</b> The frame or case of the welding machine must be grounded in accordance with specific requirements (29 CFR 1910.254(c)(2)(i)).	Verify that the frame or case of the welding machine is grounded under the conditions and according to the methods given in 29 CFR 1910, subpart S.  (NOTE: This requirement does not apply to engine driven machines.)
<b>WL.60.8.</b> Work-lead circuits must meet specific requirements (29 CFR 1910.254 (c)(2)(ii)).	Verify that conduits containing electrical conductors are not used for completing a work-lead circuit.  Verify that pipelines are not used as a permanent part of a work-lead circuit.  (NOTE: Pipelines may be used as part of a work-lead circuit during construction, extension or repair, providing current is not carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work-lead cable.)
<b>WL.60.9.</b> Chains, wire ropes, cranes, hoists, and elevators must not be used to carry welding current (29 CFR 1910.254(c) (2)(iii)).	Verify that chains, wire ropes, cranes, hoists, and elevators are not used to carry welding current.
<b>WL.60.10.</b> Joints must be bonded or provided with adequate current collecting devices under certain circumstances (29 CFR 1910.254(c)(2)(iv)).	Verify that, where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints are bonded or provided with adequate current collecting devices.
<b>WL.60.11.</b> All ground connections must be checked to determine that they are mechanically strong and	Verify that all ground connections are checked to determine that they are mechanically strong and electrically adequate for the required current.

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<p>electrically adequate for the required current (29 CFR 1910.254(c)(2)(v)).</p> <p><b>WL.60.12.</b> Disconnect switches must be provided under certain circumstances (29 CFR 1910.254(c)(3)(i)).</p> <p><b>WL.60.13.</b> For individual welding machines, the rated current-carrying capacity of the supply conductors must be not less than the rated primary current of the welding machine (29 CFR 1910.254 (c)(3)(ii)).</p> <p><b>WL.60.14.</b> Specific standards must be complied with in operations involving several welders on one structure (29 CFR 1910.254(c)(3)(iv)).</p> <p><b>WL.60.15.</b> Workmen assigned to operate or maintain arc welding equipment must have knowledge of specific regulations and/or recommended safe practices (29 CFR 1910.254(d)(1)).</p>	<p>Verify that a disconnecting switch or controller is provided at or near each welding machine which is not equipped with such a switch or controller mounted as an integral part of the machine.</p> <p>Verify that the switch is in accordance with 29 CFR 1910, subpart S.</p> <p>Verify that overcurrent protection is provided as specified in 29 CFR 1910, subpart</p> <p>Verify that a disconnect switch with overload protection or equivalent disconnect and protection means, permitted by 29 CFR 1910, subpart S, is provided for each outlet intended for connection to a portable welding machine.</p> <p>Verify that, for individual welding machines, the rated current-carrying capacity of the supply conductors is not less than the rated primary current of the welding machines.</p> <p>(NOTE: For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating is determined in each case according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.)</p> <p>Verify that, where d.c. welding process requirements necessitate the use of both polarities; or where supply circuit limitations for a.c. welding require distribution of machines among the phases of the supply circuit:</p> <ul style="list-style-type: none"> <li>- all d.c. machines are connected with the same polarity</li> <li>- all a.c. machines are connected to the same phase of the supply circuit and with the same instantaneous polarity.</li> </ul> <p>Verify that workers assigned to operate or maintain arc welding equipment are acquainted with the requirements of 29 CFR 1910.254 and with 29 CFR 1910.252 (a), (b) and (c) (see the checklist items in WL.60, and WL.10 through WL.30).</p> <p>Verify that workers doing gas-shielded arc welding are acquainted with Recommended Safe Practices for Gas-Shielded Arc Welding, A6.1-1966, American Welding Society.</p>

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<p><b>WL.60.16.</b> Certain requirements must be complied with before workers may start operations (29 CFR 1910.254(d)(2) through (29 CFR 1910.254(d)(5)).</p>	<p>Verify that before starting operations all connections to the machine are checked to make certain they are properly made.</p> <p>Verify that the work lead is firmly attached to the work.</p> <p>Verify that magnetic work clamps are freed from adherent metal particles of spatter on contact surfaces.</p> <p>Verify that coiled welding cable is spread out before use to avoid serious overheating and damage to insulation.</p> <p>Verify that the grounding of the welding machine frame is checked.</p> <p>Verify that special attention is paid to safety ground connections of portable machines.</p> <p>Verify that there are no leaks of cooling water, shielding gas, or engine fuel.</p> <p>Verify that it is determined that proper switching equipment for shutting down the machine is provided.</p>
<p><b>WL.60.17.</b> Printed rules and instructions covering operation of equipment supplied by the manufacturers must be strictly followed (29 CFR 1910.254(d)(6)).</p>	<p>Verify that printed rules and instructions covering operation of equipment supplied by the manufacturers are strictly followed.</p>
<p><b>WL.60.18.</b> Electrode holders must be placed in accordance with specific requirements when they are not in use (29 CFR 1910.254(d)(7)).</p>	<p>Verify that electrode holders are so placed when not in use that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.</p>
<p><b>WL.60.19.</b> Certain measures must be taken to prevent electrical shock (29 CFR 1910.254(d)(8)).</p>	<p>Verify that cables with splices within 10 ft (3 m) of the holder are not used.</p> <p>Verify that welders do not coil or loop welding electrode cable around parts of their bodies.</p>
<p><b>WL.60.20.</b> Specific maintenance requirements must be met (29 CFR 1910.254(d)(9)).</p>	<p>Verify that the operator reports any equipment defect or safety hazard to the supervisor.</p> <p>Verify that the use of defective or hazardous equipment is discontinued until its safety has been assured.</p> <p>Verify that repairs are made by qualified personnel only.</p>

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	<p>Verify that machines which have become wet are thoroughly dried and tested before being used.</p> <p>Verify that cables with damaged insulation or exposed bare conductors are replaced.</p> <p>Verify that lengths of work and electrode cables are joined by the use of connecting means specifically intended for the purpose and that the connecting means have insulation adequate for the service conditions.</p>



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<p><b>RESISTANCE WELDING</b></p> <p><b>WL.70</b> <b>General Requirements</b></p> <p><b>WL.70.1.</b> Installation of resistance welding equipment must meet specific requirements (29 CFR 1910.255 (a)(1)).</p> <p><b>WL.70.2.</b> Ignitron tubes used in resistance welding equipment must be equipped with a thermal protection switch (29 CFR 1910.255(a)(2)).</p> <p><b>WL.70.3.</b> Personnel designated to operate resistance welding equipment must have been properly instructed and judged competent to operate resistance welding equipment (29 CFR 1910.255(a)(3)).</p> <p><b>WL.70.4.</b> Controls of all automatic or air and hydraulic clamps must be arranged or guarded to prevent the operator from accidentally activating them (29 CFR 1910.255 (a)(4)).</p>	<p>Verify that all equipment is installed by a qualified electrician in conformance with 29 CFR 1910, subpart S.</p> <p>Verify that there is a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine.</p> <p>Verify that ignitron tubes used in resistance welding equipment are equipped with a thermal protection switch.</p> <p>Verify that personnel designated to operate resistance welding equipment have been properly instructed and judged competent to operate resistance welding equipment.</p> <p>Verify that the controls of all automatic or air and hydraulic clamps are arranged or guarded to prevent the operator from accidentally activating them.</p>



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<p><b>RESISTANCE WELDING</b></p> <p><b>WL.80</b>  <b>Spot and Seam Welding Machines (Nonportable)</b></p> <p><b>WL.80.1.</b> All external weld initiating control circuits must operate on low voltage (29 CFR 1910.255 (b)(1)).</p> <p><b>WL.80.2.</b> Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) must meet specific requirements (29 CFR 1910.255(b)(2)).</p> <p><b>WL.80.3.</b> All doors and access panels of all resistance welding machines and control panels must be kept locked and interlocked to prevent access, by unauthorized persons, to live portions of the equipment (29 CFR 1910.255(b)(3)).</p> <p><b>WL.80.4.</b> Guarding of press welding machine operations must meet specific requirements (29 CFR 1910.255(b) (4)).</p>	<p>Verify that all external weld initiating control circuits operate on low voltage.</p> <p>(NOTE: Low voltage is voltage not over 120 volts.)</p> <p>Verify that stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) are suitably insulated and protected by complete enclosures.</p> <p>Verify that all doors of such enclosures are provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks).</p> <p>Verify that such interlocks or contacts are so designed as to effectively interrupt power and short circuit all capacitors when the door or panel is open.</p> <p>Verify that a manually operated switch or suitable positive device is installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.</p> <p>Verify that all doors and access panels of all resistance welding machines and control panels are kept locked and interlocked to prevent access by unauthorized persons to live portions of the equipment.</p> <p>Verify that all press welding machine operations are effectively guarded by the use of a device such as an electronic eye safety circuit, two hand controls, or protection similar to that prescribed for punch press operations in 29 CFR 1910.217.</p> <p>(NOTE: The above requirement applies where there is a possibility of the operator's fingers being under the point of operation.)</p> <p>Verify that all chains, gears, operating bus linkage, and belts are protected by</p>

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<p><b>WL.80.5.</b> Shield guards of safety glass or suitable fire-resistant plastic must be installed at the points of operation, wherever practical (29 CFR 1910.255(b)(5)).</p> <p><b>WL.80.6.</b> All foot switches must be guarded to prevent accidental operation of the machine (29 CFR 1910.255(b)(6)).</p> <p><b>WL.80.7.</b> Two or more safety emergency stop buttons must be provided on all special multispot welding machines (29 CFR 1910.255(b)(7)).</p> <p><b>WL.80.8.</b> Safety pins must be provided on large machines (29 CFR 1910.255(b)(8)).</p> <p><b>WL.80.9.</b> The grounding of nonportable spot and seam welding machines must meet specific requirements (29 CFR 1910.255(b)(9)).</p>	<p>adequate guards, in accordance with 29 CFR 1910.219.</p> <p>Verify that shield guards of safety glass or suitable fire-resistant plastic are installed at point of operations of operation, wherever practical.</p> <p>(NOTE: This action is taken in order to reduce the hazard of flying sparks.)</p> <p>Verify that additional shields or curtains are installed as necessary to protect passing persons from flying sparks.</p> <p>Verify that all foot switches are guarded to prevent accidental operation of the machine.</p> <p>Verify that two or more safety emergency stop buttons are provided on all special multispot welding machines.</p> <p>(NOTE: This requirement also applies to 2-post and 4-post weld presses.)</p> <p>Verify that four safety pins with plugs and receptacles (one in each corner) are provided so that when safety pins are removed and inserted in the ram or platen, the press becomes inoperative.</p> <p>Verify that the secondary of all welding transformers used in multispot, projection and seam welding machines is grounded, where technically practicable.</p> <p>(NOTE: This may be done by permanently grounding one side of the welding secondary current circuit.)</p> <p>(NOTE: Where grounding is not technically practical, a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternates.)</p> <p>Verify that safety disconnect is arranged to open both sides of the line when welding current is not present.</p>

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<p><b>RESISTANCE WELDING</b></p> <p><b>WL.90</b>  <b>Portable Welding Machines</b></p> <p><b>WL.90.1.</b> All portable welding guns must have suitable counterbalanced devices for supporting the guns, including cables (29 CFR 1910.255 (c)(1)).</p> <p><b>WL.90.2.</b> Suspended portable welding equipment must be equipped with safety chains or cable that meet specific requirements (29 CFR 1910.255(c)(2)).</p> <p><b>WL.90.3.</b> Each clevis must meet specific load requirements (29 CFR 1910.255(c)(3)).</p> <p><b>WL.90.4.</b> Initiating switches on portable welding guns must meet specific requirements (29 CFR 1910.255(c)(4)).</p> <p><b>WL.90.5.</b> The movable holder, where it enters the gun frame, must have sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder (29 CFR 1910.255(c)(5)).</p>	<p>Verify that all portable welding guns have suitable counterbalanced devices for supporting the guns, including cables.</p> <p>(NOTE: This requirement does not apply if the design of the gun or fixture makes counterbalancing impractical or unnecessary.)</p> <p>Verify that all portable welding guns, transformers and related equipment that is suspended from overhead structures, eye beams, trolleys, etc., is equipped with safety chains or cables.</p> <p>Verify that the safety chains or cables are capable of supporting the total shock load in the event of failure of any component of the supporting system.</p> <p>Verify that each clevis is capable of supporting the total shock load of the suspended equipment in the event of trolley failure.</p> <p>Verify that all initiating switches, including retraction and dual schedule switches, located on the portable welding gun are equipped with suitable guards capable of preventing accidental initiation through contact with fixturing, operator's clothing, etc.</p> <p>Verify that the voltage of the initiating switch does not exceed 24 volts.</p> <p>Verify that the movable holder, where it enters the gun frame, has sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder.</p>

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<b>WL.90.6.</b> The grounding of portable welding machines must meet certain requirements (29 CFR 1910.255(c) (6)).	Verify that the secondary and case of all portable welding transformers is grounded.  (NOTE: Secondary grounding may be by center tapped secondary or by a center tapped grounding reactor connected across the secondary.)

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<p><b>RESISTANCE WELDING</b></p> <p><b>WL.100</b> <b>Flash Welding Equipment</b></p> <p><b>WL.100.1.</b> Flash welding machines must be equipped with a hood to control flying flash (29 CFR 1910.255(d)(1)).</p> <p><b>WL.100.2.</b> Ventilation for flash welding machines must meet specific standards in cases of high production (29 CFR 1910.255(d)(1)).</p> <p><b>WL.100.3.</b> Fire-resistant curtains or suitable shields must be set up around flash welding machines (29 CFR 1910.255(d)(2)).</p>	<p>Verify that flash welding machines are equipped with a hood to control flying flash.</p> <p>Verify that, in cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation is provided that is in accordance with the requirements of 29 CFR 1910.252(c) (see the checklist items in WL.30).</p> <p>Verify that fire-resistant curtains or suitable shields are set up around flash welding machines in such a way that the operator's movements are not hampered.</p>



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<p><b>RESISTANCE WELDING</b></p> <p><b>WL.110 Maintenance</b></p> <p><b>WL.110.1.</b> Maintenance and maintenance-related record keeping must meet specific requirements (29 CFR 1910.255(e)).</p>	<p>Verify that periodic inspection is made by qualified maintenance personnel, and that a certification record is maintained.</p> <p>Verify that the certification record includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, for the equipment inspected.</p> <p>Verify that the operator is instructed to report any equipment defects to the supervisor.</p> <p>Verify that the use of the equipment is discontinued until safety repairs have been completed.</p>



## **CHAPTER 52**

### **SAFETY-RELATED WORK PRACTICES**

## CHAPTER 52

### SAFETY: SAFETY-RELATED WORK PRACTICES

#### ECAMP-ANG

September 1997

#### Applicability

The provisions of this chapter cover electrical safety-related work practices for:

1. both *qualified and unqualified personnel* working on, near, or with the following installations:
  - a. premises wiring
  - b. wiring for connection to supply
  - c. other wiring
  - d. optical fiber cable
2. work performed by *unqualified personnel* on, near, or with the following installations:
  - a. generation, transmission, and distribution
  - b. communications
  - c. in vehicles
  - d. railway.

The provisions of this chapter do not apply to work performed by *qualified personnel* on or directly associated with the following installations:

1. generation, transmission, and distribution
2. communication
3. in vehicles
4. railway.

#### Compliance Definitions

- *Assistant Secretary* - the Assistant Secretary of Labor for Occupational Safety and Health or designee (29 CFR 1910.156(c)(4)).
- *Communications Installations* - installations of communication equipment to the extent that the work is covered under 29 CFR 1910.268 (29 CFR 1910.331(c)(2)).
- *Fixed Equipment* - equipment fastened in place or connected by permanent wiring methods (29 CFR 1910.333(b)(2)).
- *Generation, Transmission, and Distribution Installations* - installations for the generation, control, transformation, transmission, and distribution of electrical energy (including communication and metering) located in buildings used for such purposes or located outdoors. Work on or directly associated with generation, transmission, and distribution installations includes (29 CFR 1910.331(c)(1)):
  1. work performed directly on such installations, such as repairing overhead or underground distribution lines or repairing a feedwater pump for the boiler in a generating plant
  2. work directly associated with such installation, such as line-clearance tree trimming and replacing utility poles
  3. work on electric utilization circuits in a generating plant provided that such circuits are commingled with installations of power generation equipment or circuits, and the generation equipment or circuits present greater electrical hazards than those posed by the utilization equipment or circuits (such as exposure to higher voltages or lack of overcurrent protection).

- *Installations in Vehicles* - installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles (29 CFR 1910.331(c)(3)).
- *Optical Fiber Cable Installations* - installations of optical fiber cable where such installations are made along with electric conductors (29 CFR 1910.331(a)(4)).
- *Other Wiring Installations* - installations of other outside conductors on the premises (as opposed to premises wiring, wiring for connection to supply, or optical fiber cable) (29 CFR 1910.331(a)(3)).
- *Portable Electric Equipment* - cord- and plug-connected equipment, including flexible cord sets (extension cords) (29 CFR 1910.334(a)).
- *Premises Wiring Installations* - installations of electrical conductors and equipment within or on buildings or other structures, and on other premises such as yards, carnival, parking, and other lots, and industrial substations. This includes work on or directly associated with installations of utilization equipment used for purposes other than generating, transmitting, or distributing electric energy (such as installations which are in office buildings, garages, machine shops, or recreational buildings, or other utilization installations which are not an integral part of a generating installation, substation, or control center) (29 CFR 1910.331(a)(1)).
- *Qualified Person* - regarding the control of hazardous energy, a qualified person is familiar with the construction and operation of the equipment and the hazards involved. Personnel undergoing on-the-job training and who, in the course of such training, have demonstrated an ability to perform duties safely at their level of training and who are under the direct supervision of qualified personnel are considered to be qualified personnel for the performance of those duties (29 CFR 1910.399).
- *Railway Installations* - installations of railways for generation, transformation, transmission, or distribution of rolling stock or installations of railways used exclusively for signaling and communication purposes (29 CFR 1910.331(c)(4)).
- *Unqualified Personnel* - personnel with little or no training in avoiding the electrical hazards of working on or near exposed energized parts (29 CFR 1910.331(a)).
- *Wiring for Connection to Supply Installations* - installations of conductors that connect to the supply of electricity (29 CFR 1910.331(a)(2)).

## **SAFETY: SAFETY-RELATED WORK PRACTICES**

### **GUIDANCE FOR CHECKLIST USERS**

	<b>REFER TO CHECKLIST ITEMS:</b>	<b>REFER TO PAGE NUMBERS:</b>
Training	WP.10.1 through WP.10.3	52-5
Selection and Use of Work Practices		
General Requirements	WP.20.1 through WP.20.3	52-7
Working On or Near Exposed Deenergized Parts	WP.30.1 through WP.30.16	52-9
Working On or Near Exposed Energized Parts	WP.40.1 through WP.40.16	52-13
Use of Equipment	WP.50.1 through WP.50.15	52-19
Safeguards for Personal Protection	WP.60.1 through WP.60.9	52-23
Appendix 52-1, <i>Approach Distances for Qualified Employees -- Alternating Current</i>		52-27



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<b>WP.10 TRAINING</b>	<p>(NOTE: The requirements of 29 CFR 1910.332 (see the checklist items in WP.10) apply to personnel who face a risk of electric shock that is not reduced to a safe level by the electrical installation requirements of 29 CFR 1910.303 through 1910.308).</p> <p>(NOTE: Personnel in the following occupations face such a risk and are required to be trained:</p> <ul style="list-style-type: none"> <li>- electricians</li> <li>- welders.)</li> </ul> <p>(NOTE: Personnel in the following occupations also face such a risk and are required to be trained unless their work or the work of those they supervise does not bring them or the personnel they supervise close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist:</p> <ul style="list-style-type: none"> <li>- blue collar supervisors</li> <li>- electrical and electronic engineers</li> <li>- electrical and electronic equipment assemblers</li> <li>- electrical and electronic technicians</li> <li>- industrial machine operators</li> <li>- material handling equipment operators</li> <li>- mechanics and repairers</li> <li>- painters</li> <li>- riggers and roustabouts</li> <li>- stationary engineers.</li> </ul> <p>Other personnel who also may reasonably be expected to face a comparable risk of injury due to electric shock or other electrical hazards must also be trained.)</p>
<b>WP.10.1.</b> Personnel must be trained in and familiar with the safety-related work practices that pertain to their respective job assignments (29 CFR 1910.332(b)(1) and 1910.332(b)(2)).	<p>Verify that personnel are trained in and familiar with the safety-related work practices required by 29 CFR 1910.331 through 19 CFR 1910.335 that pertain to their respective job assignments.</p> <p>Verify that unqualified personnel who face a risk of electric shock that is not reduced to a safe level by the electrical installation requirements of 29 CFR 1910.303 through 1910.308, are also trained in and familiar with any electrically related safety practices not specifically addressed by 29 CFR 1910.331 through 29 CFR 1910.335 but which are necessary for their safety.</p>

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<b>WP.10.2.</b> Qualified personnel must have certain minimum training and familiarity with work on or near exposed energized parts (29 CFR 1910.332(b)(3)).	<p>Verify that qualified personnel, at a minimum, are trained in and familiar with the following:</p> <ul style="list-style-type: none"> <li>- the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment</li> <li>- the skills and techniques necessary to determine the nominal voltage or exposed live parts</li> <li>- the clearance distances specified in 29 CFR 1910.333(c) (see the checklist items in WP.40) and the corresponding voltages to which the qualified person will be exposed.</li> </ul> <p>Verify that qualified personnel whose work on energized equipment involves either direct contact or contact by means of tools or materials are also trained in and familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools as required by 29 CFR 1910.333(c)(2).</p>
<b>WP.10.3.</b> Required training must meet specific standards (29 CFR 1910.332(c)).	<p>Verify that training to work on or near exposed energized parts is either in the classroom or on-the-job.</p> <p>Verify that the degree of training provided is appropriate to the degree of risk faced by the employee.</p>

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<p><b>SELECTION AND USE OF WORK PRACTICES</b></p> <p><b>WP.20</b> <b>General Requirements</b></p> <p><b>WP.20.1.</b> Appropriate safety-related work practices must be employed to prevent electric shock or other injuries (29 CFR 1910.333(a)).</p> <p><b>WP.20.2.</b> Live parts to which personnel may be exposed must be deenergized before personnel work on or near them (29 CFR 1910.333(a)(1)).</p>	<p>Verify that, when work is performed near or on equipment or circuits which are or may be energized, safety-related work practices are employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts.</p> <p>Verify that the specific safety-related work practices are consistent with the nature and extent of the associated electrical hazards.</p> <p>Determine whether deenergizing of live parts introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.</p> <p>(NOTE: Increased or additional hazards include interruption of life support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.)</p> <p>(NOTE: Work that may be performed on or near energized circuit parts because of infeasibility due to equipment design or operational limitations include testing of electric circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous industrial process in a chemical plant that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.)</p> <p>Verify that live parts to which personnel may be exposed are deenergized before personnel work on or near them, unless doing so introduces additional or increased hazards, or is infeasible.</p> <p>(NOTE: Live parts that operate at less than 50 volts to ground need not be deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs).</p>

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<b>WP.20.3.</b> If exposed live parts are not deenergized, specific safety-related work practices must be used (29 CFR 1910.333(a)(2)).	<p>Verify that, if exposed live parts are not deenergized, other safety-related work practices are used to protect personnel who may be exposed to the electrical hazards involved.</p> <p>Verify that such work practices protect personnel against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object.</p> <p>Verify that the work practices that are used are suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts.</p> <p>(NOTE: 29 CFR 1910.333(c) (see the checklist items in WP.40) details specific work practice requirements near exposed energized parts.)</p>

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<p><b>SELECTION AND USE OF WORK PRACTICES</b></p> <p><b>WP.30</b>  <b>Working On or Near Exposed Deenergized Parts</b></p> <p><b>WP.30.1.</b> While any personnel are exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts must be locked out or tagged or both (29 CFR 1910.333(b)(2)).</p> <p><b>WP.30.2.</b> Lockout and tagging requirements must be followed in the order in which they are presented (29 CFR 1910.333(b)(2)).</p> <p><b>WP.30.3.</b> The installation must maintain and make available for inspection a written copy of the lockout and tagging procedures (29 CFR 1910.333(b)(2)(i)).</p> <p><b>WP.30.4.</b> Safe procedures for deenergizing circuits and equipment must be determined before circuits or equipment are deenergized (29 CFR 1910.333(b)(2)(ii)(A)).</p>	<p>(NOTE: 29 CFR 1910.333(b) applies to work on exposed deenergized parts or near enough to them to expose personnel to any electrical hazard they present.)</p> <p>(NOTE: 29 CFR 1910.333(b) does not apply to conductors and parts of electric equipment that have been deenergized but have not been locked out or tagged. These are treated as energized parts, and 29 CFR 1910.333(c) applies to work on or near them.)</p> <p>Verify that, while any personnel are exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts are locked out or tagged or both.</p> <p>Verify that the lock out and/or tagging requirements are followed in the order in which they are presented (i.e., 29 CFR 1910.333(b)(2)(i) (see checklist item WL.30.3) first, then 29 CFR 1910.333(b)(2)(ii) (see checklist item WL.30.4), etc.).</p> <p>Verify that the installation maintains a written copy of the lockout and tagging procedures described in 29 CFR 1910.333(b)(2) (see the checklist items in WP.30).</p> <p>Verify that the written copy of the procedures is available for inspection by personnel, the Assistant Secretary of Labor, and the Assistant Secretary of Labor's authorized representatives.</p> <p>(NOTE: The written procedures may be in the form of a copy of 29 CFR 1910.333(b).)</p> <p>Verify that safe procedures for deenergizing circuits and equipment are determined before circuits or equipment are deenergized.</p>

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<b>WP.30.5.</b> Circuits and equipment to be worked on must be disconnected from all electric energy sources (29 CFR 1910.333(b) (2)(ii)(B)).	<p>Verify that the circuits and equipment to be worked on are disconnected from all electric energy sources.</p> <p>Verify that control circuit devices (such as push buttons, selector switches, and interlocks) are not used as the sole means for deenergizing circuits or equipment.</p> <p>Verify that interlocks for electric equipment are not used as a substitute for lock-out and tagging procedures.</p>
<b>WP.30.6.</b> Stored electric energy which might endanger personnel must be released (29 CFR 1910.333(b)(2)(ii)(C)).	<p>Verify that stored electric energy which might endanger personnel is released.</p> <p>Verify that, if the stored electric energy might endanger personnel, capacitors are discharged and high capacitance elements are short-circuited and grounded.</p> <p>Verify that if the capacitors or associated equipment are handled in meeting this requirement, they are treated as energized. (See 29 CFR 1910.333(c) (the checklist items in WP.40).)</p>
<b>WP.30.7.</b> Stored non-electric energy which might endanger personnel must be released (29 CFR 1910.333(b)(2)(ii)(D)).	<p>Verify that stored non-electric energy in devices that could reenergize electric circuit parts are blocked or relieved to the extent that the circuit parts cannot accidentally energize the device.</p>
<b>WP.30.8.</b> A lock and tag must be placed on each disconnecting means (29 CFR 1910.333(b)(2)(iii)(A) and 1910.333(b)(2)(iii)(B)).	<p>Verify that a lock and tag are placed on each on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided in 29 CFR 1910.333(b)(2)(iii)(C) and (b)(2)(iii)(E) (see the checklist items in WP.30.9 and WP.30.10).</p> <p>Verify that the lock is attached so as to prevent personnel from operating the disconnecting means unless they use undue force or tools.</p> <p>Verify that each tag contains a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.</p>
<b>WP.30.9.</b> A tag used without a lock must be supplemented by at least one additional safety measure (29 CFR 1910.333(b)(2)(iii)(C) and 1910.333(b)(2)(iii)(D)).	<p>Verify that a tag is used without a lock only if a lock cannot be applied or tagging procedures provide an equivalent level of safety.</p> <p>Verify that a tag used without a lock is supplemented by at least one additional safety measure in order to provide a level of safety equivalent to that obtained by the use of a lock.</p> <p>(NOTE: Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.)</p>

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<b>WP.30.10.</b> A lock placed without a tag must meet certain specific requirements (29 CFR 1910.333(b)(2)(iii)(E)).	Verify that a lock is placed without a tag only when <i>all</i> of the following conditions are met:  <ul style="list-style-type: none"> <li>- only one circuit or piece of equipment is deenergized</li> <li>- the lockout period does not extend beyond the work shift</li> <li>- employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.</li> </ul>
<b>WP.30.11.</b> The deenergized condition must be verified before any circuits or equipment are considered and worked as deenergized (29 CFR 1910.333(b)(2)(iv)(A) and 1910.333(b)(2)(iv)(B)).	Verify that a qualified person operates the equipment operating controls or otherwise verifies that the equipment cannot be restarted.  Verify that a qualified person uses test equipment to verify that the circuit element and electrical parts of equipment to which employees will be exposed are deenergized.  Verify that the test also determines whether any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed.  (NOTE: This test is required even though specific parts of the circuit have been deenergized and presumed to be safe.)  Verify that, if the circuit to be tested is over 600 volts, nominal, the test equipment is checked for proper operation immediately before and immediately after this test.
<b>WP.30.12.</b> Reenergizing requirements must be followed in the order in which they are presented (29 CFR 1910.333(b)(2)(v)).	Verify that the reenergizing requirements are followed in the order in which they are presented (i.e., checklist item WP.30.13 first, then checklist item WP.30.14, etc.), before circuits or equipment are reenergized, even temporarily.
<b>WP.30.13.</b> A qualified person must conduct tests and visual inspections to verify that all devices have been removed (29 CFR 1910.333(b)(2)(v)(A)).	Verify that a qualified person conducts tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed.
<b>WP.30.14.</b> Personnel exposed to the hazards associated with reenergizing must be warned to stay clear (29 CFR 1910.333(b)(2)(v)(B)).	Verify that personnel exposed to the hazards associated with reenergizing the circuit or equipment are warned to stay clear of circuits and equipment.
<b>WP.30.15.</b> Each lock and tag must be removed in accordance with certain specific	Determine whether the employee who applied the lock or tag is available at the installation.

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<p>requirements (29 CFR 1910.333(b)(2)(v) (C)(1) and 1910.333(b)(2) (v)(C)(2)).</p> <p><b>WP.30.16.</b> There must be a visual determination that all employees are clear of the circuits and equipment before reenergizing (29 CFR 1910.333(b)(2) (v)(D)).</p>	<p>Verify that, if the employee who applied the lock or tag is available, each lock and tag is removed by the employee who applied it or under his or her direct supervision.</p> <p>Verify that, if this employee is absent, the lock or tag is removed by a qualified person designated to perform the task.</p> <p>Verify that the employee who applied the lock or tag is aware that the lock or tag has been removed before he or she resumes work at that workplace.</p> <p>Verify that there is a visual determination that all employees are clear of the circuits and equipment before reenergizing.</p>

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<p><b>SELECTION AND USE OF WORK PRACTICES</b></p> <p><b>WP.40</b>  <b>Working On or Near Exposed Energized Parts</b></p> <p><b>WP.40.1.</b> Work on or near energized parts must be performed only by qualified personnel (29 CFR 1910.333(c)(1) and 1910.333(c)(2)).</p> <p><b>WP.40.2.</b> If work is to be performed near overhead lines, the lines must be deenergized and grounded, or other protective measures provided, before work is started (29 CFR 1910.333(c)(3)).</p>	<p>(NOTE: 29 CFR 1910.333(c) (see the checklist items in WP.40) applies to work performed on exposed live parts (involving either direct contact or contact by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.)</p> <p>Verify that only qualified personnel work on electric circuit parts or equipment that have not been deenergized. (See 29 CFR 1910.333(b).)</p> <p>Verify that the qualified personnel are capable of working safely on energized circuits.</p> <p>Verify that the qualified personnel are familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.</p> <p>Verify that, if work is to be performed near overhead lines, the lines are deenergized and grounded, or other protective measures are provided before work is started.</p> <p>Verify that, if the lines are to be deenergized, arrangements are made with the person or organization that operates or controls the electric circuits involved to deenergize and ground them.</p> <p>Verify that, if protective measures, such as guarding, isolating, or insulating are provided, these precautions prevent personnel from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.</p> <p>(NOTE: The work practices used by qualified personnel installing insulating devices on overhead power transmission or distribution lines are covered by 29 CFR 1910.269, not by 29 CFR 1910.332 through 1910.335, and unqualified persons are prohibited from performing this type of work.)</p>

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<p><b>WP.40.3.</b> Unqualified personnel working in an elevated position must be located a certain minimum distance from any unguarded, energized overhead lines (29 CFR 1910.333(c)(3)(i)(A)(1) and 1910.333(c)(3)(i)(A)(2)).</p>	<p>Verify that, when unqualified personnel work in an elevated position in the vicinity of overhead lines, the location is such that personnel and the longest conductive object they may contact cannot come closer to unguarded, energized overhead lines than the following distances:</p> <ul style="list-style-type: none"> <li>- for voltages to ground 50kV or below - 10 ft (305 cm)</li> <li>- for voltages to ground over 50kV - 10 ft (305 cm) plus 4 in. (10 cm) for every 10kV over 50 kV.</li> </ul>
<p><b>WP.40.4.</b> Unqualified personnel working on the ground must be located a certain minimum distance from any unguarded, energized overhead lines (29 CFR 1910.333(c)(3)(i)(B)).</p>	<p>Verify that, when unqualified personnel work on the ground in the vicinity of overhead lines, the location is such that personnel may not bring any conductive object closer to unguarded, energized, overhead lines than the following distances:</p> <ul style="list-style-type: none"> <li>- for voltages to ground 50kV or below - 10 ft (305 cm)</li> <li>- for voltages to ground over 50kV - 10 ft (305 cm) plus 4 in. (10 cm) for every 10kV over 50 kV.</li> </ul> <p>(NOTE: For voltages normally encountered with overhead power lines, objects which do not have an insulating rating for the voltage involved are considered to be conductive.)</p>
<p><b>WP.40.5.</b> Qualified personnel must be located a certain minimum distance from any unguarded, energized overhead lines (29 CFR 1910.333(c)(3)(ii)).</p>	<p>Verify that, when qualified personnel work in the vicinity of overhead lines, whether in an elevated position or on the ground, personnel do not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than the distances specified in Appendix 52-1.</p>
<p><b>WP.40.6.</b> Qualified personnel who are closer than the minimum distance from any unguarded, energized overhead lines must be insulated in accordance with certain requirements (29 CFR 1910.333(c)(3)(ii)(A) through 29 CFR 1910.333(c)(3)(ii)(C)).</p>	<p>Verify that qualified personnel who are closer than the minimum distance from any unguarded, energized overhead lines are insulated by one of the following means:</p> <ul style="list-style-type: none"> <li>- the person is insulated from the energized part</li> <li>- the energized part is insulated both from all other conductive objects at a different potential and from the person</li> <li>- the person is insulated from all conductive objects at a potential different from that of the energized part.</li> </ul>
<p><b>WP.40.7.</b> Any vehicle or mechanical equipment capable of having parts of its structure elevated must be operated so that clearance between it and energized overhead lines is in accor-</p>	<p>Verify that, when any vehicle or mechanical equipment capable of having parts of its structure elevated is located near energized overhead lines, it is operated so that a clearance of 10 ft (305 cm) is maintained.</p> <p>Verify that if the voltage is higher than 50kV, the clearance is increased 4 in. (10 cm) for every 10kV over that voltage.</p>

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<p>dance with certain requirements (29 CFR 1910.333(c)(3)(iii)(A).</p> <p><b>WP.40.8.</b> Personnel standing on the ground must contact the vehicle or mechanical equipment in accordance with certain requirements (29 CFR 1910.333(c)(3)(iii)(B)(1) and (29 CFR 1910.333(c)(3)(iii)(B)(2)).</p> <p><b>WP.40.9.</b> When any vehicle or mechanical equipment capable of having parts of its structure elevated is near energized lines and intentionally grounded, personnel working on the ground near the point of grounding must be protected from hazardous ground potential (29 CFR 1910.333(c)(3)(iii)(C)).</p> <p><b>WP.40.10.</b> Illumination that enables personnel to perform their work safely must be provided in spaces containing exposed energized parts (29 CFR 1910.333(c)(4)).</p>	<p>(NOTE: Exceptions are made to the clearance requirements only in the following circumstances:</p> <ul style="list-style-type: none"> <li>- while any vehicle or mechanical equipment capable of having parts of its structure elevated is in transit with its structure lowered, the clearance may be reduced to 4 ft (122 cm)</li> <li>- in the presence of insulating barriers installed to prevent contact with the lines which are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier if the equipment is an aerial lift insulated for the voltage involved and the work is performed by qualified personnel, the clearance (between the insulated portion and the power line) may be reduced in accordance with the guidelines of Appendix 52-1.)</li> </ul> <p>Verify that personnel standing on the ground contact the vehicle or mechanical equipment or any of its attachments only if either one of the following occurs:</p> <ul style="list-style-type: none"> <li>- personnel are using protective equipment rated for the voltage</li> <li>- the equipment is located so that no uninsulated part of its structure can come closer to the line than permitted in 29 CFR 1910.333(c)(3)(iii) (see checklist item WP.40.7).</li> </ul> <p>(NOTE: The uninsulated part of the structure is that portion of the structure that provides a conductive path to personnel on the ground.)</p> <p>Verify that, when any vehicle or mechanical equipment capable of having parts of its structure elevated is near energized lines and intentionally grounded, personnel working on the ground near the point of grounding stand at the grounding location whenever there is a possibility of overhead line contact.</p> <p>Verify that additional precautions, such as use of barricades or insulation, are taken to protect employees from hazardous ground potentials.</p> <p>(NOTE: The additional precautions taken should depend on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.)</p> <p>Verify that illumination that enables personnel to perform their work safely is provided in spaces containing exposed energized parts.</p> <p>Verify that, if such illumination is not provided, personnel do not enter these spaces.</p> <p>Verify that, where lack of illumination or an obstruction precludes observation of the work to be performed, personnel do not perform tasks near exposed energized parts.</p>

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<p><b>WP.40.11.</b> Personnel who work in confined or enclosed work spaces that contain exposed energized parts must take certain precautions (29 CFR 1910.333(c)(5)).</p> <p><b>WP.40.12.</b> Conductive materials and equipment must be handled in accordance with certain requirements (29 CFR 1910.333(c)(6)).</p> <p><b>WP.40.13.</b> Portable ladders must have nonconductive siderails if they are used where personnel or the ladder could contact exposed energized parts (29 CFR 1910.333(c)(7)).</p> <p><b>WP.40.14.</b> Conductive jewelry and clothing must not be worn if they might contact exposed energized parts (29 CFR 1910.333(c)(8)).</p> <p><b>WP.40.15.</b> Housekeeping duties in proximity to energized parts must meet certain requirements (29 CFR 1910.333(c)(9)).</p>	<p>Verify that personnel do not reach blindly into areas which may contain energized parts.</p> <p>Verify that personnel working in a confined or enclosed space (such as a man-hole or vault) that contains exposed energized parts are provided and use protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with these parts.</p> <p>Verify that doors, hinged panels, etc. are secured to prevent their swinging into personnel and causing personnel to contact exposed energized parts.</p> <p>Verify that conductive materials and equipment that are in contact with any part of an employee's body are handled in a manner that will prevent the materials and equipment from contacting exposed energized conductors or circuit parts.</p> <p>Verify that, if personnel must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, work practices which will minimize the hazard are implemented.</p> <p>(NOTE: Examples of work practices which will minimize this hazard are the use of insulation, guarding, and material handling techniques.)</p> <p>Verify that portable ladders have nonconductive siderails if they are used where personnel or the ladder could contact exposed energized parts.</p> <p>Verify that conductive articles of jewelry and clothing are not worn if they might contact exposed energized parts.</p> <p>(NOTE: Examples of conductive articles of jewelry and clothing are watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear.)</p> <p>(NOTE: Such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.)</p> <p>Verify that, where live parts present an electrical contact hazard, personnel do not perform housekeeping duties at such close distances to the parts that there is a possibility of such contact, unless adequate safeguards (such as insulating equipment or barriers) are provided.</p> <p>Verify that electrically conductive cleansing materials (including conductive solids such as steel wool, metalized cloth, and silicon carbide, as well as conduc-</p>

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<p><b>WP.40.16.</b> Electric safety interlocks must only be defeated by qualified personnel temporarily working on the equipment (29 CFR 1910.333(c)(10)).</p>	<p>tive liquid solutions) are not used in proximity to energized parts unless procedures are followed which will prevent electrical contact.</p> <p>Verify that only qualified personnel defeat an electrical safety interlock, and then only temporarily while working on the equipment.</p> <p>Verify that the interlock system is returned to its operable condition when this work is completed.</p>



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<p><b>WP.50</b>  <b>USE OF EQUIPMENT</b></p> <p><b>WP.50.1.</b> Portable electric equipment must be handled in a manner which will not cause damage (29 CFR 1910.334(a)(1)).</p> <p><b>WP.50.2.</b> Portable electrical equipment must be visually inspected before use on any shift for external defects and evidence of possible internal damage (29 CFR 1910.334(a)(2)(i)).</p> <p><b>WP.50.3.</b> Defective or damaged portable electrical equipment must be removed from service until rendered safe (29 CFR 1910.334(a)(2)(ii)).</p> <p><b>WP.50.4.</b> Attachment plugs and receptacles must be checked to ensure that they are of proper mating configurations (29 CFR 1910.334(a)(2)(iii)).</p> <p><b>WP.50.5.</b> Grounding-type equipment must be used in accordance with certain requirements (29 CFR 1910.334(a)(3)(i) through (iii)).</p>	<p>Verify that portable electrical equipment is handled in a manner which will not cause damage.</p> <p>Verify that flexible cords are not fastened with staples or otherwise hung in a fashion that could damage the outer jacket or insulation.</p> <p>Verify that portable electric equipment is visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket).</p> <p>(NOTE: Portable electric equipment which remains connected once it is put in place and is not exposed to damage need not be visually inspected until it is relocated.)</p> <p>Verify that, if there is a defect or evidence of damage in portable electrical equipment that might expose an employee to injury, the defective or damaged item is removed from service.</p> <p>Verify that personnel do not use the defective or damaged item until repairs and tests necessary to render the equipment safe have been made.</p> <p>Verify that, when an attachment plug is to be connected to a portable electrical equipment receptacle (including any on a cord set) the relationship of the plug and receptacle contacts are first checked to ensure that they are of proper mating configurations.</p> <p>Verify that a flexible cord used with grounding-type equipment contains an equipment grounding conductor.</p> <p>Verify that attachment plugs and receptacles are not connected or altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles.</p> <p>Verify that attachment plugs and receptacles are not altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.</p>

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<p><b>WP.50.6.</b> Portable electrical equipment that is likely to come in contact with water or conductive liquids must be approved for those locations (29 CFR 1910.334(a)(4)).</p> <p><b>WP.50.7.</b> Personnel must have dry hands when plugging and unplugging energized equipment (29 CFR 1910.334(a)(5)(i)).</p> <p><b>WP.50.8.</b> Energized plug and receptacle connections must be handled with insulating protective equipment if the connection could provide a conducting path to the operator's hand (29 CFR 1910.334(a)(5)(ii)).</p> <p><b>WP.50.9.</b> Locking-type connectors must be properly secured after connection (29 CFR 1910.334(a)(5)(iii)).</p> <p><b>WP.50.10.</b> Devices specifically designed as disconnecting means must be used for routine opening and closing of electric power and lighting circuits (29 CFR 1910.334(b)(1)).</p> <p><b>WP.50.11.</b> Reclosing electric power and lighting circuits after protective device operation must be done in accordance with certain requirements (29 CFR 1910.334(b)(2)).</p>	<p>Verify that adapters which interrupt the continuity of the equipment grounding connection are not used.</p> <p>Verify that portable electrical equipment used in highly conductive work locations such as those inundated with water or other conductive liquids, or in job locations where personnel are likely to contact water or conductive liquids, is approved for those locations.</p> <p>Verify that, if energized equipment is involved, personnel do not have wet hands when plugging and unplugging flexible cords and cord- and plug-connected equipment.</p> <p>Verify that energized plug and receptacle connections are handled with insulating protective equipment if the condition of the connection could provide a conducting path to the operator's hand.</p> <p>(NOTE: An example of such a condition is a cord connector that is wet from being immersed in water.)</p> <p>Verify that locking-type connectors are properly secured after connection.</p> <p>Verify that load rated switches, circuit breakers, or other devices specifically designed as disconnecting means are used for the opening, reversing, or closing of electric power and lighting circuits under load conditions.</p> <p>Verify that cable connectors not of the loadbreak type, fuses, terminal lugs, and cable splice connections, are not used for such purposes, except in an emergency.</p> <p>Verify that after an electric power and lighting circuit is deenergized by a circuit protective device, the circuit is not manually reenergized until it has been determined that the equipment and circuit can be safely energized.</p> <p>Verify that there is no repetitive manual reclosing of circuit breakers or reenergizing circuits through replaced fuses.</p> <p>(NOTE: When it can be determined from the design of the circuit and the over-current devices involved that the automatic operation of a device was caused by</p>

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<p><b>WP.50.12.</b> Overcurrent protection modification of electric power and lighting circuits must meet certain requirements (29 CFR 1910.334(b)(3)).</p> <p><b>WP.50.13.</b> Testing work on electric circuits and equipment must be done by qualified personnel (29 CFR 1910.334(c)(1)).</p> <p><b>WP.50.14.</b> Test instruments and equipment must meet certain requirements (29 CFR 1910.334(c)(2) and 1910.333(c)(3)).</p> <p><b>WP.50.15.</b> Where flammable materials are present only occasionally, electric equipment capable of igniting them must not be used unless measures are taken to prevent hazard (29 CFR 1910.334(d)).</p>	<p>an overload rather than a fault condition, no examination is needed before the circuit is reenergized.)</p> <p>Verify that overcurrent protection of electric power and lighting circuits and conductors is not modified, even on a temporary basis, beyond that allowed by the installation safety requirements for overcurrent protection. (See 29 CFR 1910.304(e).)</p> <p>Verify that only qualified personnel perform testing work on electric circuits or equipment.</p> <p>Verify that test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors are visually inspected for external defects and damage before the equipment is used.</p> <p>Verify that if there is a defect or evidence of damage that might expose personnel to injury, the defective or damaged item is removed from service.</p> <p>Verify that defective or damaged instruments or equipment are not used until they are rendered safe.</p> <p>Verify that test instruments and equipment and their accessories are rated for the circuits and equipment to which they will be connected.</p> <p>Verify that test instruments and equipment and their accessories are designed for the environment in which they will be used.</p> <p>Verify that, where flammable materials are present only occasionally, electric equipment capable of igniting them is not used, unless measures are taken to prevent hazardous conditions from developing.</p> <p>(NOTE: Such materials include, but are not limited to:</p> <ul style="list-style-type: none"> <li>- flammable gases, vapors, or liquids</li> <li>- combustible dust</li> <li>- ignitable fibers or flyings.)</li> </ul> <p>(NOTE: Electrical installation requirements for locations where flammable materials are present on a regular basis are contained in 29 CFR 1910.307.)</p>



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<p><b>WP.60</b>  <b>SAFEGUARDS FOR PERSONAL PROTECTION</b></p> <p><b>WP.60.1.</b> Personnel working in areas where there are potential electrical hazards must be provided with and use appropriate protective equipment (29 CFR 1910.335 (a)(1)(i), 1910.335(a)(1)(iv) and 1910.335(a)(1)(v)).</p> <p><b>WP.60.2.</b> Protective equipment must be maintained, inspected and periodically tested in accordance with certain requirements (29 CFR 1910.335(a)(1)(ii)).</p> <p><b>WP.60.3.</b> If the insulating capability of protective equipment may be subject to damage during use, the insulating material must be protected (29 CFR 1910.335 (a)(1)(iii)).</p> <p><b>WP.60.4.</b> Insulated tools or handling equipment must be used if there is danger of contact with exposed energized conductors or circuit parts (29 CFR 1910.335 (a)(2)(i)).</p>	<p>Verify that personnel working in areas where there are potential electrical hazards are provided with and use electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.</p> <p>Verify that personnel wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.</p> <p>Verify that personnel wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.</p> <p>(NOTE: Personal protective equipment requirements are contained in Subpart I of 29 CFR 1910 (see the checklist items in SP.10 for eye and face protection requirements).)</p> <p>Verify that protective equipment is maintained in a safe, reliable condition.</p> <p>Verify that the equipment is periodically inspected or tested as required by 29 CFR 1910.137 (See the checklist items in SP.40).</p> <p>Verify that, if the insulating capability of protective equipment may be subject to damage during use, the insulating material is protected.</p> <p>(NOTE: An example is an outer covering of leather for the protection of rubber insulating material.)</p> <p>Verify that, when working near exposed energized conductors or circuit parts, personnel use insulated tools or handling equipment if the tools or handling equipment might come in contact with such conductors or parts.</p>

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<p><b>WP.60.5.</b> If the insulating capability of insulated tools or handling equipment may be subject to damage during use, the insulating material must be protected (29 CFR 1910.335(a)(2)(i)).</p>	<p>Verify that, if the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material is protected.</p>
<p><b>WP.60.6.</b> Fuse handling equipment insulated for the circuit voltage must be used to remove or install fuses when the fuse terminals are energized (29 CFR 1910.335(a)(2)(i)(A)).</p>	<p>Verify that fuse handling equipment insulated for the circuit voltage is used to remove or install fuses when the fuse terminals are energized.</p>
<p><b>WP.60.7.</b> Ropes and handlines used near exposed energized parts must be non-conductive (29 CFR 1910.335(a)(2)(i)(B)).</p>	<p>Verify that ropes and handlines used near exposed energized parts are nonconductive.</p>
<p><b>WP.60.8.</b> Protective shields, protective barriers, or insulating materials must be used to protect personnel from shock, burns, or other electrically related injuries (29 CFR 1910.335(a)(2)(ii)).</p>	<p>Verify that protective shields, protective barriers, or insulating materials are used to protect personnel from shock, burns, or other electrically related injuries while they work near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur.</p>
<p><b>WP.60.9.</b> Proper alerting techniques must be used to warn and protect personnel from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts (29 CFR 1910.335(b)(1) through 1910.335(b)(3)).</p>	<p>Verify that, when normally enclosed live parts are exposed for maintenance or repair, they are guarded to protect unqualified personnel from contact with the live parts.</p> <p>Verify that proper alerting techniques are used to warn and protect personnel from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts.</p> <p>Verify that safety signs, safety symbols, or accident prevention tags are used where necessary to warn personnel about electrical hazards which may endanger them.</p> <p>Verify that barricades are used in conjunction with safety signs where it is necessary to prevent or limit access to work areas exposing personnel to uninsulated energized conductors or circuit parts.</p> <p>Verify that conductive barricades are not used where they might cause an electrical contact hazard.</p>

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	Verify that, if signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant is stationed to warn and protect personnel.



## Appendix 52-1

### Approach Distances for Qualified Employees -- Alternating Current (29 CFR 1910.333, Table S-5)

Voltage range (phase to phase)	Minimum approach distance
300 V and less	Avoid contact
Over 300V, not over 750 V	1 ft 0 in. (30.5 cm)
Over 750V, not over 2kV	1 ft 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft 6 in. (107 cm)
Over 87.5kV, not over 121kV	4 ft 0 in. (122 cm)
Over 121kV, not over 140 kV	4 ft 6 in. (137 cm)

